



Interactive E-learning Application

BIOLOGY

By A Group Of Supervisors

Main Book

FREE GIFT NOT FOR SALE

1st SEC.
2024
FIRST TERM

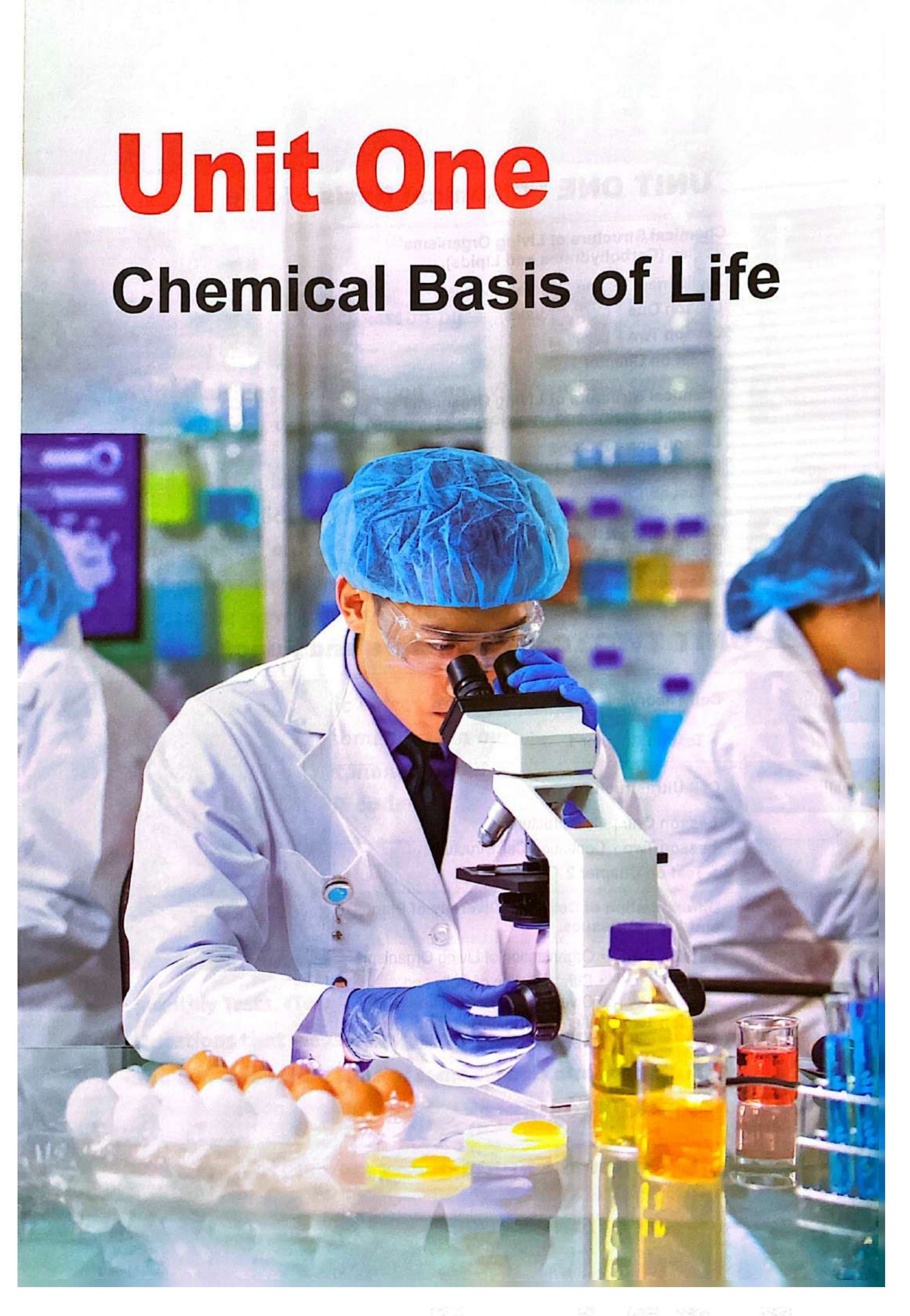
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UNIT ONE : Chemical Basis of Life



UNIT TWO : Cell : Structure and Function




Unit One
Chemical Basis of Life

Unit Introduction

Biology is highly related to chemistry in one science known as "Biochemistry", and it is the science that studies the chemical structure of living organisms bodies and the chemical reactions that take place inside their cells.

Objectives of the unit

The living organisms' cells consist of four main types of organic molecules that are necessary for their life and called "biological macro-molecules" like :

▶ Carbohydrates. ▶ Lipids. ▶ Proteins. ▶ Nucleic acids.

By the end of this unit, the student should be able to:

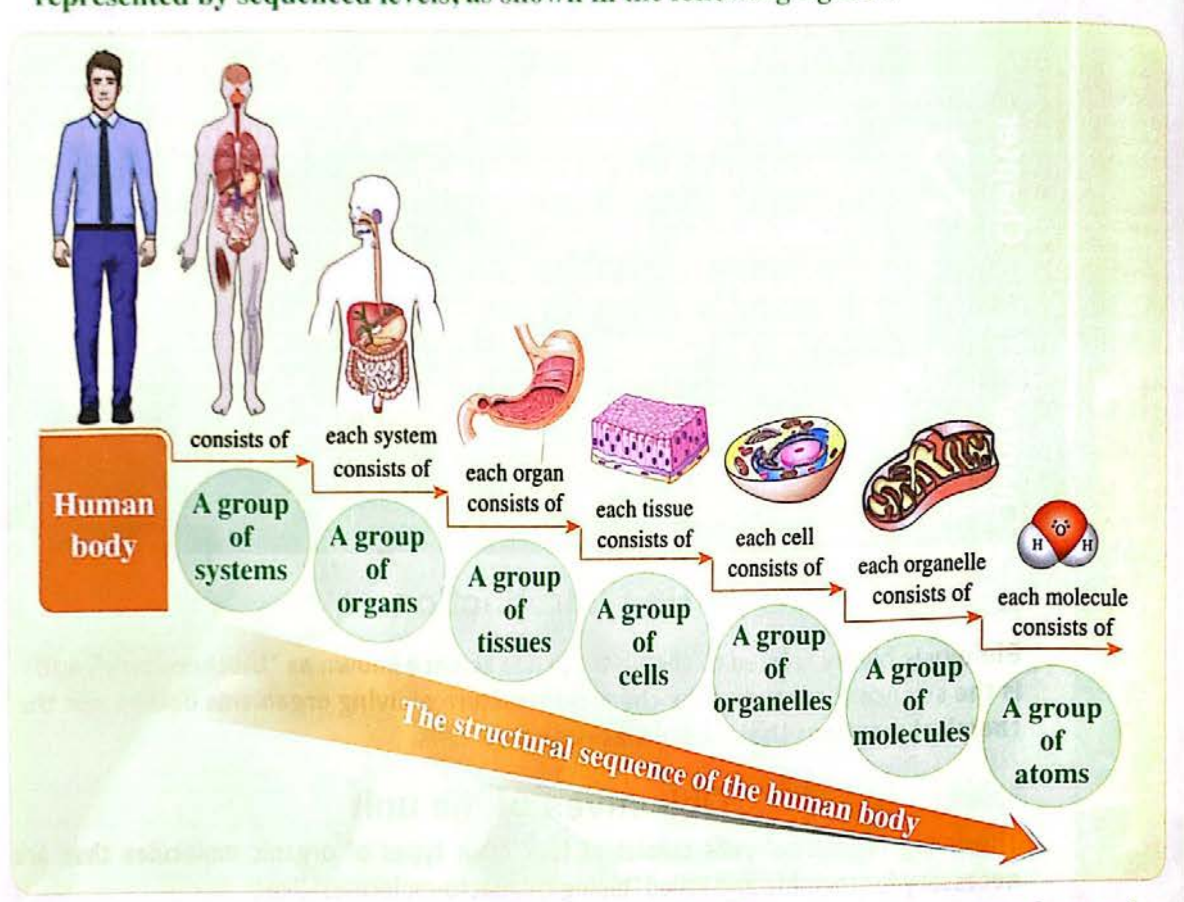
- Determine the substances from which the living organisms' bodies are made up.
- Describe the molecular structure of carbohydrates, lipids, proteins and nucleic acids.
- Determine the functions of carbohydrates, lipids, proteins and nucleic acids.
- Explain the role of monosaccharides in the processes of production and transferring energy inside the cells of living organisms.
- Explain the relationship among the sequence of amino acids in the polypeptide chains, the structure and variation of the proteins.
- Identify carbohydrates, lipids and proteins practically.
- Determine what is meant by metabolism in living organisms (catabolism and anabolism).
- Determine what is meant by enzymes and mechanisms and principles of their functions.
- Explore the effect of the medium pH on the enzyme activity.
- Clarify the effect of temperature on the enzyme activity practically.
- Appreciate the grandeur of Allah for the accurate structure of living organisms' bodies.

Chapter 1

Preliminary Lesson

Macro-molecules

★ **The structure of higher living organisms' bodies, especially the human body, is represented by sequenced levels, as shown in the following figure :**



★ **By tracking this sequence, we find that the cells of the living organism are made up of :**

① Organic molecules	② Inorganic molecules
They are large-sized molecules that mainly contain carbon (C) and hydrogen (H) atoms and called "Biological macro-molecules"	They are molecules that aren't conditioned to contain carbon (C) atoms.
Examples	
	Water (H_2O).
	Mineral salts (e.g. NaCl).

Correct your information

Not all the molecules that contain hydrogen or carbon atoms or both are considered organic molecules, example : - Water molecules (H_2O). - Carbon dioxide gas (CO_2).
- Calcium carbonate ($CaCO_3$). - Sodium bicarbonate ($NaHCO_3$).

Biological macro-molecules

- They are large-sized organic compounds that are made up of smaller molecules.
- All of them contain carbon element.
- They are extremely necessary for the life of the living organisms.
- Most biological macro-molecules are called **polymers** that are formed by the combination of small-sized molecules called **monomers** through the **polymerization** process, as shown in the following figure :

Polymerization process →

Monomers | Polymer

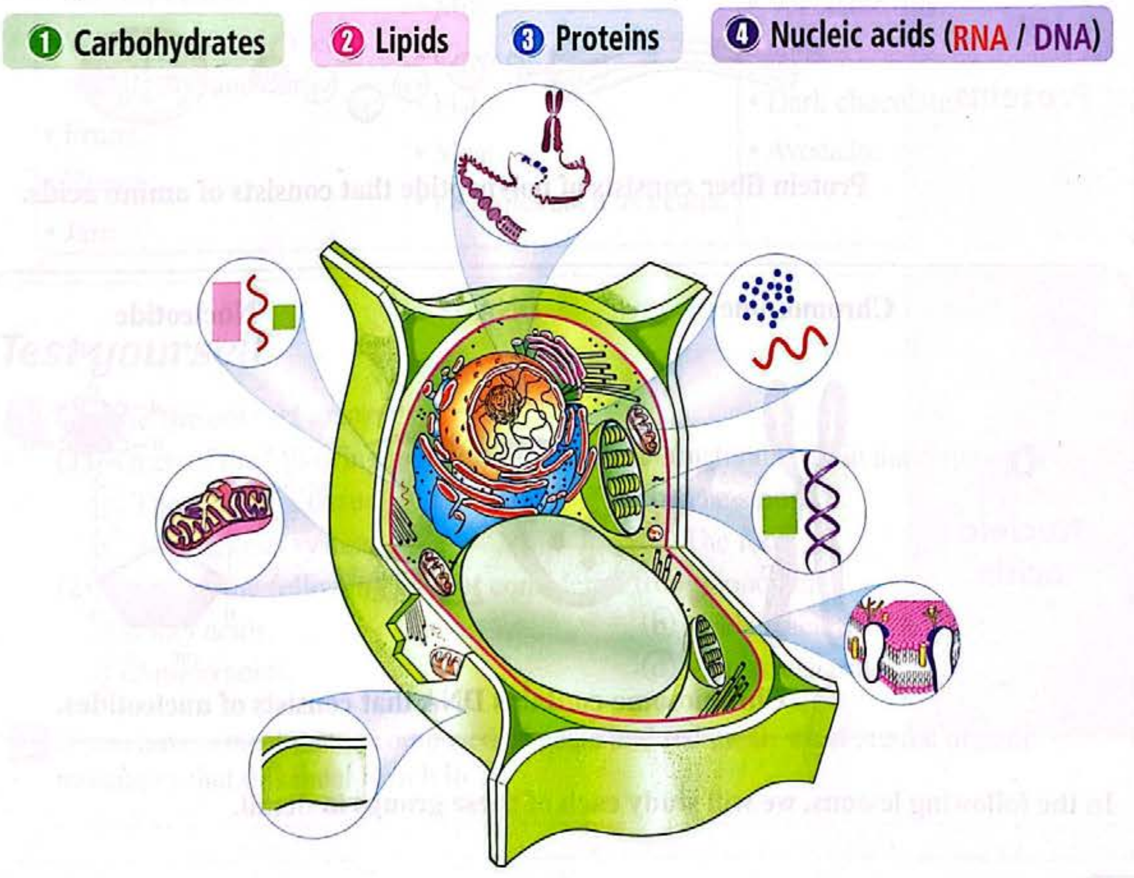
THE ORIGIN OF WORD

* "Polymer" is a Greek word that consists of two parts, (Poly) which means multi and (mer) which means part, i.e. multi parts or multi units.

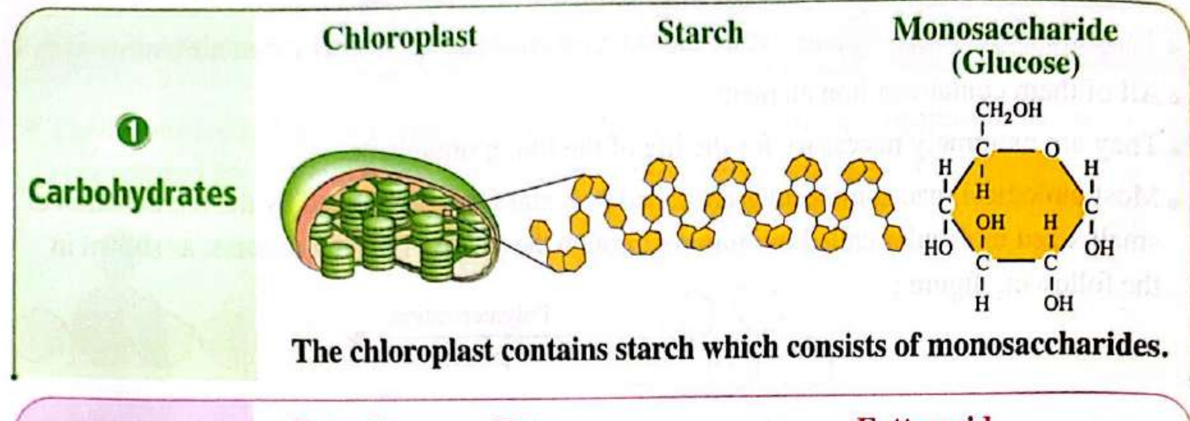
* "Monomer" is a Greek word that consists of two parts, (Mono) which means one or uni and (mer) which means part, i.e. unipart or one part.

- The biological macro-molecules enter in the structure of the living cell components and these molecules are classified according to their molecular structure and the functions that they perform into **four groups, which are :**

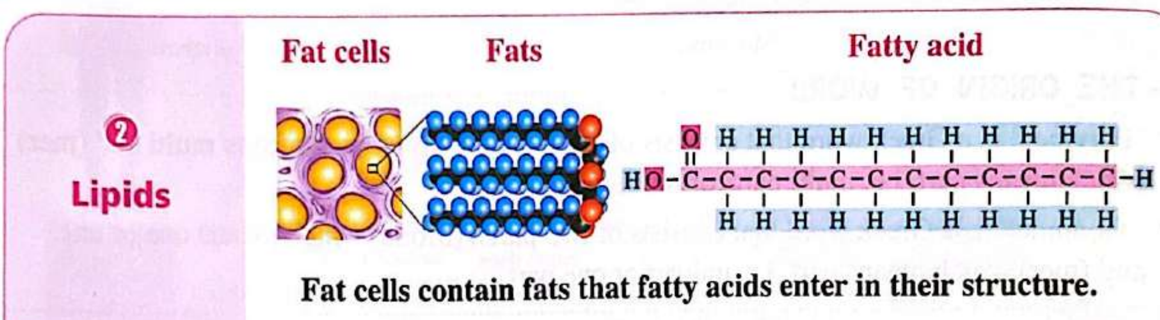
① Carbohydrates ② Lipids ③ Proteins ④ Nucleic acids (RNA / DNA)



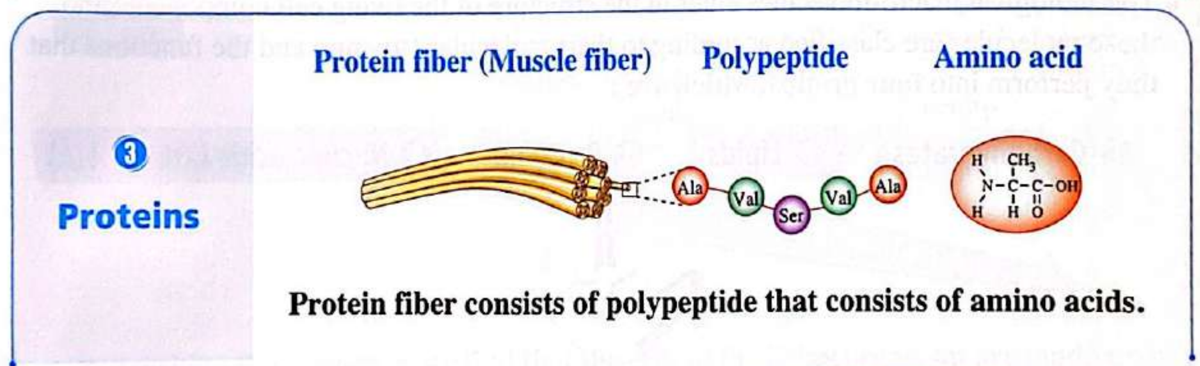
- **Each group consists of smaller molecules, as shown in the following figures :**



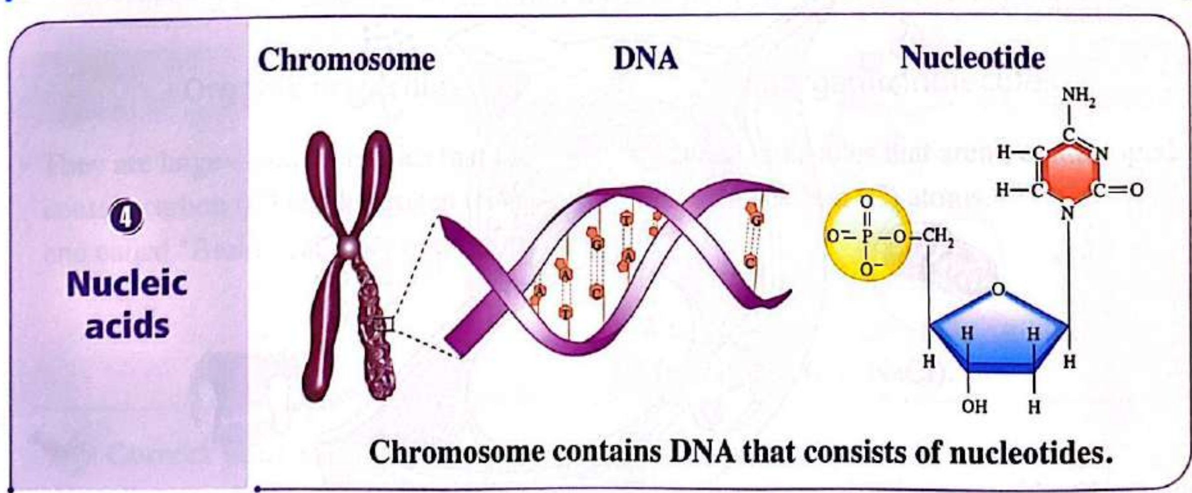
The chloroplast contains starch which consists of monosaccharides.



Fat cells contain fats that fatty acids enter in their structure.



Protein fiber consists of polypeptide that consists of amino acids.



Chromosome contains DNA that consists of nucleotides.

In the following lessons, we will study each of these groups in detail.

Biology in our daily life

The biological macro-molecules (organic molecules) and the inorganic molecules are present in the human body within the diets we eat.

• **Example :** in the meal in front of you :



1. Beans, cheese and egg are considered sources which are rich in proteins.
2. Milk products, such as (cheese) is one of the sources which are rich in fats, vitamins and mineral salts. Besides, oil which is a source of fats.
3. Bread which is made of wheat flour or corn is one of the sources which are rich in carbohydrates and mineral salts.

The following table illustrates some meals that are rich in biological macro-molecules :

Carbohydrates	Proteins	Lipids
• Vegetables, such as sweet potatoes, potatoes, eggplant and pea. • Kidney beans. • Whole grains such as wheat, rice and corn. • Fruits. • Honey. • Jam.	• Egg (Egg white). • Cheese. • Yoghurt. • Milk. • Chicken. • Fish. • Meat. • Legumes such as beans.	• Egg (Yolk). • Butter. • Full-cream yoghurt. • Vegetable oils. • Nuts. • Dark chocolate. • Avocado.



Test yourself



1 Choose the correct answer :

(1) Which of the following represents the highest structural level in the elephant body ?

ⓐ The muscular tissue. ⓑ The stomach.
ⓒ The nervous system. ⓓ The foot.

(2) Which of the following are <u>not</u> considered from monomers ?

ⓐ Fatty acids. ⓑ Nucleic acids.
ⓒ Amino acids. ⓓ Monosaccharides.

2 If you have a meal that is composed of pasta and red meat, **what** are the organic molecules that this meal is rich in ?

....

Why do you think, people who fast for long periods feel exhausted and may have headache ?

Chapter 1

Lesson One

Carbohydrates

Carbohydrates

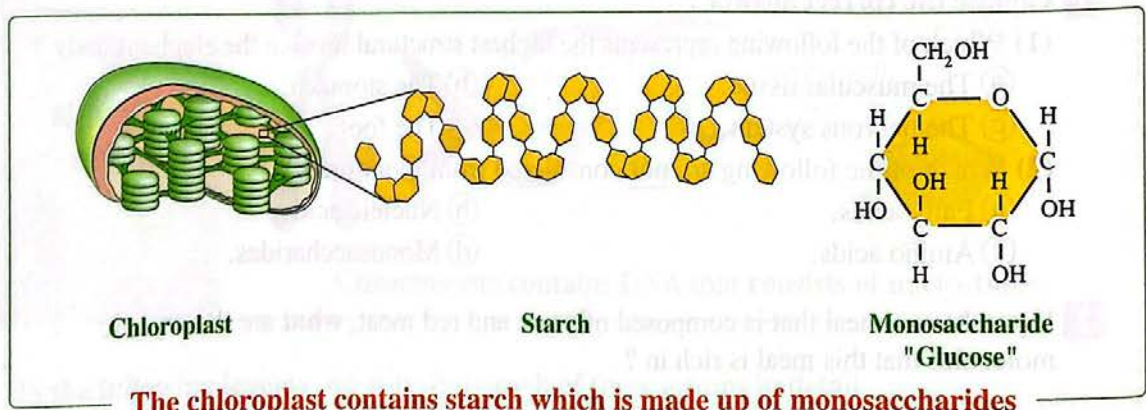
They are biological macro-molecules (polymers) that are made up of many smaller molecules (monomers) called monosaccharides (the simplest type of carbohydrates).

Biology in our daily life

Fibers are considered one of the plant food components, where cellulose enters in their structure, and they are indigestible inside the human body, but they help in pushing the food inside the digestive system especially the large intestine, which participates in facilitating the defecation process.

- They include sugars, starches and fibers.
- **The general formula of carbohydrates (monosaccharides) is $(CH_2O)_n$**

From this formula, it is shown that carbohydrates are made up of carbon (C), hydrogen (H) and oxygen (O) atoms with a ratio (1 : 2 : 1) respectively.



The chloroplast contains starch which is made up of monosaccharides

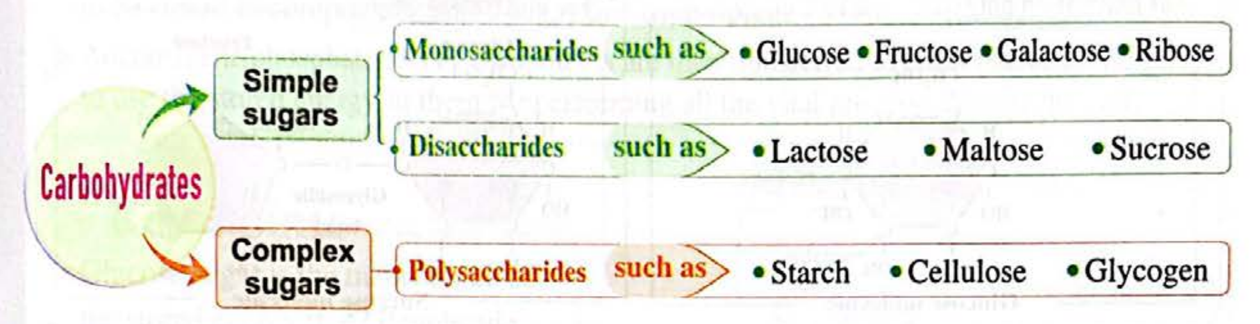


Key Points

From the general formula of the most monosaccharides $(CH_2O)_n$, we find that symbol (n) indicates the number of carbon atoms that enter in the structure of monosaccharide, for example : in glucose $(C_6H_{12}O_6)$, the symbol (n) equals (6) .... and so on.

Classification of carbohydrates

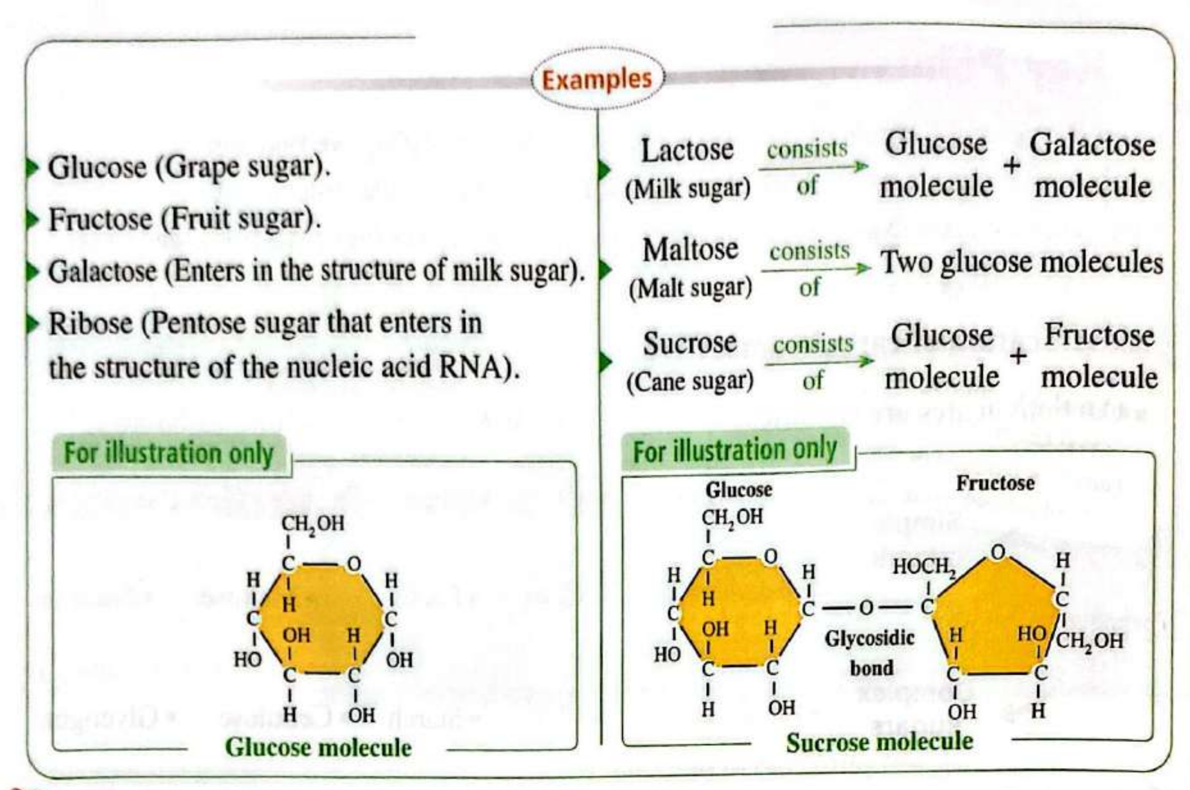
- **Carbohydrates are classified, according to their molecular structure, as follows :**



1 Simple Sugars

- **Their properties :**
  - Soluble in water.
  - Having a low molecular weight.
  - Often having a sweet taste.
- **Their types :**

Monosaccharides	Disaccharides
Molecular structure	
They are made up of one molecule only which consists of a chain of carbon atoms (3 : 6 atoms), where each carbon atom is connected to oxygen and hydrogen atoms in a certain way. **Therefore,** monosaccharides are considered the simplest type of sugars.	They are made up of two molecules of monosaccharides linked together to form a disaccharide molecule. Monosaccharide + Monosaccharide ⟶ Disaccharide



Examples

- Glucose (Grape sugar).
- Fructose (Fruit sugar).
- Galactose (Enters in the structure of milk sugar).
- Ribose (Pentose sugar that enters in the structure of the nucleic acid RNA).

- Lactose (Milk sugar) consists of → Glucose molecule + Galactose molecule
- Maltose (Malt sugar) consists of → Two glucose molecules
- Sucrose (Cane sugar) consists of → Glucose molecule + Fructose molecule

Glucose molecule

Sucrose molecule

Key Points

- If a monosaccharide sugar is linked with another monosaccharide sugar, water molecule (H_2O) is eliminated during the chemical reaction, in order to form a disaccharide sugar whose molecular formula decreases by two hydrogen atoms and one oxygen atom (in the resulted compound from the combination).

- **Example :**

$$C_6H_{12}O_6 + C_6H_{12}O_6 \xrightarrow{-H_2O} C_{12}H_{22}O_{11}$$

Glucose molecule	Fructose molecule	Sucrose molecule

For illustration only

H_2O

Dehydration reaction

Glucose molecule Fructose molecule Sucrose molecule

- If more than one monosaccharide sugar are linked together to form a complex sugar "polysaccharide", the number of eliminated water molecules decreases by one than the number of monosaccharide molecules that are linked together.

• **Example :**

If four glucose molecules are linked together to form a polysaccharide sugar, three water molecules are eliminated during the reaction (i.e. 6 hydrogen atoms and 3 oxygen atoms), and its molecular formula is ($C_{24}H_{42}O_{21}$).

Role of monosaccharides in energy production processes inside the living organisms' cells :

• **During glucose oxidation inside the cells in mitochondria, the following occurs :**

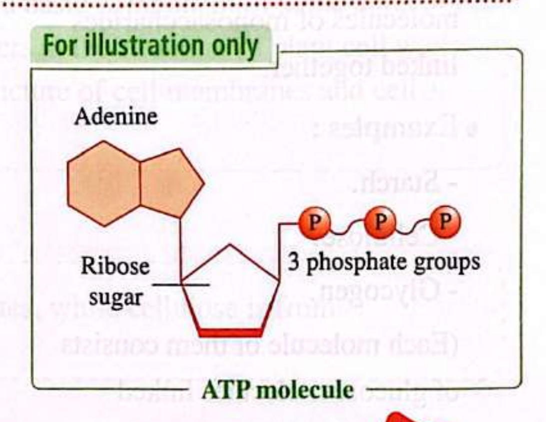
1. The stored energy in the chemical bonds that are present in glucose molecule is released to be stored in compounds called adenosine triphosphate (ATP).
2. Adenosine triphosphate (ATP) compounds are then transferred to other places in the cell to use the stored energy in them for performing all the vital processes inside the cell.

Key Points

• Glucose sugar is the main source of the stored energy in ATP molecule.

• ATP is the direct source of energy inside the body cells and is called by **"the currency of energy in the cell"**

For illustration only



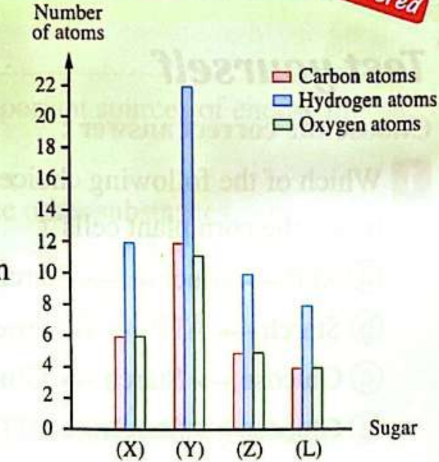
ATP molecule

Test yourself

Answered

Choose the correct answer :

1 The opposite graph illustrates the number of carbon, hydrogen and oxygen atoms in a various group of saccharides, study it, then choose the correct answer :



(1) What is the ratio of carbon, oxygen and hydrogen atoms in sugar (L) respectively ?

ⓐ 2 : 1 : 1 ⓑ 1 : 2 : 2

ⓒ 1 : 2 : 1 ⓓ 1 : 1 : 2

(2) Which of the following represents the sugar that enters in the structure of a nucleic acid in the living cell ?

ⓐ (X). ⓑ (Y). ⓒ (Z). ⓓ (L).

(3) Which of the following represents the sugar that is found as one of the mother's milk components ?

ⓐ (L). ⓑ (Y). ⓒ (Y) and (L). ⓓ (Z) and (L).

2 Which of the following organic compounds contain(s) the least number of glucose molecules ?

ⓐ Glycogen molecule. ⓑ Cellulose molecule.
ⓒ Two molecules of malt sugar. ⓓ Three molecules of cane sugar.

2 Complex sugars (Polysaccharides)

- **Their properties :**

- Insoluble in water. - Having a high molecular weight. - Don't have a sweet taste.

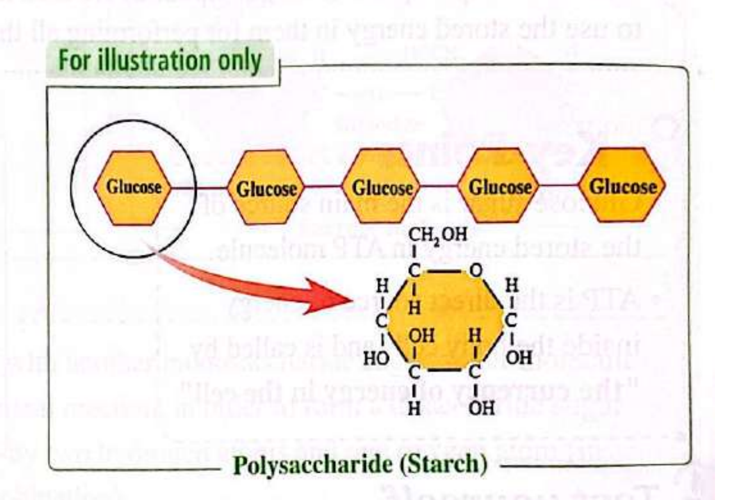
- **Their molecular structure :**

They are made up of many molecules of monosaccharides linked together.

- **Examples :**

- Starch.
- Cellulose.
- Glycogen.

(Each molecule of them consists of glucose molecules linked together by different ways).



Polysaccharide (Starch)

2 Test yourself

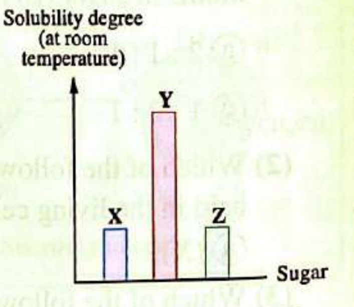
Answered

Choose the correct answer :

1 Which of the following choices is considered a pathway for producing energy inside the corn plant cells ?

ⓐ ATP → Glucose → Starch → Glucose.
ⓑ Starch → ATP → Glucose → ATP
ⓒ Glucose → Starch → Glucose → ATP
ⓓ Glucose → Starch → ATP

2 In the opposite graph, what is compound (Y) ?



ⓐ Starch. ⓑ Cellulose.
ⓒ Glycogen. ⓓ Sucrose.

3 Which of the following **doesn't** produce symmetrical monomers on its hydrolysis ?

ⓐ Sucrose. ⓑ Glycogen. ⓒ Starch. ⓓ Maltose.

Importance of carbohydrates

1 Obtaining energy → Carbohydrates are considered from the main and fast sources for obtaining energy.

2 Storing energy →
- Carbohydrates are used for storing energy in living organisms, until be needed, where :
  - Plants store carbohydrates in the form of **starch**.
  - Each of human and animal stores carbohydrates in the form of **glycogen** in the cells of liver and muscles.

3 Building cells →
- Carbohydrates are considered a basic component of some parts of the cell, such as **cellulose** that enters in the structure of plant cell walls.
- Carbohydrates enter in the structure of cell membranes and cell protoplasm.

Key Points

Starch and glycogen are from the stored carbohydrates, while cellulose is from the structural carbohydrates.

3 *Test yourself*



Choose the correct answer :

1 Why are carbohydrates considered from the most important sources of energy in the living organism ?

ⓐ Because they contain energy that is higher than the other substances.

ⓑ Because they are easily stored.

ⓒ Because energy is obtained rapidly from them.

ⓓ Because they can be produced by cells.

2 Which of the following is(are) considered from the structural carbohydrates in the cells of some living organisms ?

ⓐ Glycogen and cellulose. ⓑ Starch and glycogen.

ⓒ Starch only. ⓓ Cellulose only.



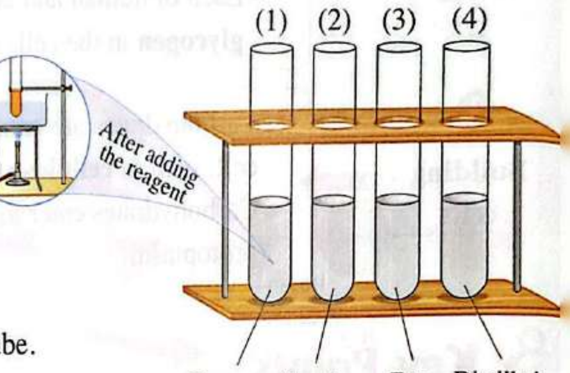
1 Detection of monosaccharides



1. Used materials and tools :

- Water bath.
- 4 test tubes.
- Egg albumin.
- Pen.
- Burner.
- Glucose solution.
- Distilled water.
- Tube handler.
- Tube rack.
- Starch solution.
- Blue Benedict's reagent.

2. Procedure :



1. Label the test tubes from (1) : (4).
2. Put 2 mL of each of the following in the four tubes respectively :
   - Glucose solution.
   - Starch solution.
   - Egg albumin.
   - Distilled water.
3. Add 2 mL of Benedict's reagent to each tube.
4. Place the tubes in water bath for 5 minutes, then turn off the burner.

3. Observations and explanations :

Tube no.	Substance	Observations	Explanations
(1)	Glucose solution.	Indicator's blue colour is changed into orange. (Positive result)	Indicator's colour in tube no. (1) is changed, because glucose is one of the monosaccharides that change the colour of Benedict's reagent from blue into orange.
(2)	Starch solution.	Indicator's colour doesn't change. (Negative result)	• Indicator's colour in the three tubes is not changed, because : - Starch is one of the complex sugars (polysaccharides) that don't change the colour of Benedict's reagent. - Egg albumin and distilled water don't contain any monosaccharides.
(3)	Egg albumin.		
(4)	Distilled water.		

4. Conclusion :

Benedict's reagent is used for detecting the simple sugars such as glucose in various types of food.

THE ORIGIN OF WORD

Benedict's reagent is a chemical reagent named after the American chemist Stanley Rossiter Benedict, and the blue colour of the reagent is due to containing copper (II) sulphate.



Practical Activity 2 — Detection of starch



1. Used materials and tools :

- Some food samples :
  - Soybean.
  - Macaroni.
  - Wheat.
  - Sugar.
  - Green apple.
  - Carrot.
  - Celery.
  - Bread.
  - Milk powder.
  - Tomato.
  - Pea seeds.
- Iodine solution.
- Dropper.

Note

Some substances need to be grinded, such as soybean, macaroni and wheat.

2. Procedure :

Detect the presence of starch in the previous samples by adding some drops of iodine solution to them.

3. Observations and explanations :

The orange colour of iodine solution turns into dark blue in the food samples that are rich in starch, and remains without changing in the samples of food that don't contain starch.

Food samples rich in starch	Food samples have a little amount of starch		Food samples don't contain starch	
• Macaroni. • Wheat. • Bread.	• Soybean. • Pea seeds.	• Carrot. • Celery.	• Sugar. • Tomato.	• Green apple. • Milk powder.

Note

The degree of the resulted colour after adding the iodine solution to food substances depends on the amount of starch in them.

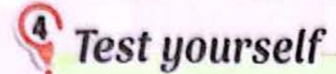
4. Conclusion :

Iodine solution is used for detecting the presence of starch in various types of food.

Life application :

★ Blue Benedict's reagent is used for detecting sugar in blood and urine.

★ We should reduce eating sugary and starchy foods (especially diabetic and obese patients), where the excess monosaccharide sugars in the body are converted into fats and deposit in different regions in the body leading to obesity.



Test yourself



Choose the correct answer :

1 Which of the following food substances you can depend on if you want to lose weight ?

ⓐ Glucose and lactose.

ⓑ Sucrose and starch.

ⓐ Fructose and starch.

ⓓ Fructose and cellulose.

2 Which of the following changes the colour of Benedict's reagent ?

ⓐ Cellulose.

ⓑ Starch.

ⓐ Glycogen.

ⓓ Glucose.

3 On adding iodine solution to a sample of plant tissue of a corn plant leaf, which of the following probabilities represents the effect of the solution on each of the chloroplasts and cell wall ?

	Chloroplasts	Cell wall
ⓐ	Dark blue	Dark blue
ⓑ	Orange	Dark blue
ⓒ	Dark blue	Orange
ⓓ	Orange	Orange

Chapter 1

Questions on Preliminary Lesson &Lesson One

• Macro-molecules.
• Carbohydrates.



The questions signed by ✻ are answered in detail. ● Understand ● Apply ● Analyze



Interactive test

First Multiple Choice Questions

1. Which of the following structural levels is the highest from the biological macro-molecules ?
   - (a) Organelles.
   - (b) Atoms.
   - (c) Tissues.
   - (d) Cells.

2. Which of the following elements are the most abundant in living organisms ?
   - (a) Carbon, hydrogen and oxygen.
   - (b) Carbon, nitrogen and oxygen.
   - (c) Carbon, nitrogen and hydrogen.
   - (d) Nitrogen, hydrogen and oxygen.

3. How far are these statements "all the mineral salts contain carbon atoms", "the mineral salts are from the organic molecules" correct ?
   - (a) The two statements are correct.
   - (b) The two statements are wrong.
   - (c) The first statement is correct and the second statement is wrong.
   - (d) The first statement is wrong and the second statement is correct.

4. How far are these statements "all the biological macro-molecules contain carbon element", "every chemical compound that contains carbon element is from the biological macro-molecules" correct ?
   - (a) The two statements are correct.
   - (b) The first statement is correct and the second statement is wrong.
   - (c) The first statement is wrong and the second statement is correct.
   - (d) The two statements are wrong.

5. ✻ During photosynthesis process, a large number of glucose molecules is produced in the chloroplasts, what is the name of the process by which these molecules stored inside the cell ?
   - (a) Oxidation.
   - (b) Reduction.
   - (c) Polymerization.
   - (d) Hydrolysis.

6. The monosaccharides contain ....
   - (a) 3 : 6 oxygen atoms.
   - (b) 3 hydrogen atoms : 3 oxygen atoms.
   - (c) 3 : 6 hydrogen atoms.
   - (d) 6 : 12 carbon atoms.

7 * If you know that the number of hydrogen atoms in a monosaccharide = (X), what is the number of carbon atoms ?

ⓐ $\frac{1}{2}X$ ⓑ X^2 ⓒ 2X ⓓ 3X

8 What is the number of oxygen atoms in ribose sugar ?

ⓐ 5 ⓑ 6 ⓒ 10 ⓓ 12

9 Which of the following are produced on the hydrolysis of 3 sucrose molecules ?

ⓐ 6 molecules of grape sugar.
ⓑ 3 molecules of grape sugar and 3 molecules of fruit sugar.
ⓒ 3 molecules of grape sugar and 3 molecules of cane sugar.
ⓓ 3 molecules of grape sugar and 3 molecules of malt sugar.

10 Which sugar molecule of the following contains 12 carbon atoms ?

ⓐ Sucrose. ⓑ Glucose. ⓒ Fructose. ⓓ Galactose.

11 Which of the following represents the normal sequence of the energy production inside the human body cells when drinking a cup of malt solution ?

ⓐ Starch ⟶ Glucose ⟶ Energy ⟶ ATP
ⓑ Sucrose ⟶ Glucose ⟶ Energy ⟶ ATP
ⓒ Maltose ⟶ Glucose ⟶ Energy ⟶ ATP
ⓓ Lactose ⟶ Glucose ⟶ ATP ⟶ Energy.

12 By using the following figures, which choice represents a molecule of malt sugar ?

ⓐ △—□ ⓑ ○—○ ⓒ ○—□ ⓓ △—○

13 Which of the following is considered a disaccharide sugar ?

ⓐ $C_3H_6O_3$ ⓑ $C_6H_{12}O_6$
ⓒ $C_{12}H_{22}O_{11}$ ⓓ $C_{18}H_{32}O_{16}$

14 * Which of the following represents the total number of glucose, fructose and galactose molecules respectively, on the hydrolysis of 20 molecules of maltose, 10 molecules of lactose and 10 molecules of sucrose ?

ⓐ 40 / 20 / 10 ⓑ 50 / 10 / 30 ⓒ 20 / 30 / 10 ⓓ 60 / 10 / 10

15 Which of the following gives a positive result with iodine solution ?

ⓐ Grape juice. ⓑ Wheat powder.
ⓒ Sugarcane juice. ⓓ Malt powder.



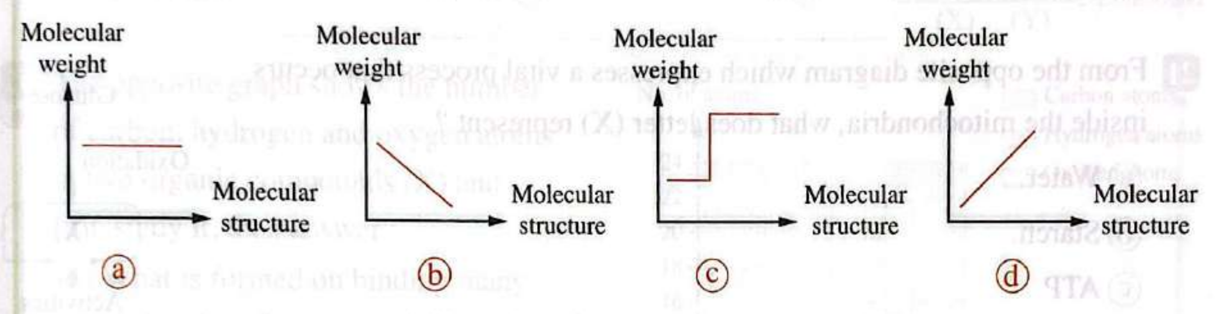
16 What is the direct source of the stored energy in ATP molecule that is required for the contraction of skeletal muscle ?

ⓐ Protein. ⓑ Glucose. ⓒ Starch. ⓓ Glycogen.

17 On which of the following the muscles depend for obtaining the energy required for their contraction and relaxation when running ?

ⓐ Starch. ⓑ Glycogen. ⓒ Mineral salts. ⓓ Protein.

18 ✻ Which of the following graphs represents the relation between the molecular structure of sugar and its molecular weight ?



19 The opposite diagram illustrates chemical equations, where symbols (A), (B) and (C) represent hexacarbon sugars, from your study to carbohydrates, answer the following questions :

$$A + A \xrightarrow[-H_2O]{Enzyme} (1)$$
$$A + B \xrightarrow[-H_2O]{Enzyme} (2)$$
$$A + C \xrightarrow[-H_2O]{Enzyme} (3)$$

(1) ✻ Which of the following sugars is/are present in the barley grains ?

ⓐ (1) only. ⓑ (2) only.
ⓒ (2) and (3). ⓓ (1) and (3).

(2) ✻ Which of the following statements is wrong ?

ⓐ Sugar (A) is mainly used to produce energy in most cells.
ⓑ Sugar (A) enters in the structure of disaccharides only.
ⓒ Sugars (A), (B) and (C) have the same molecular formula.
ⓓ Sugars (A), (B) and (C) have the same number of atoms.

(3) Which of the following may represent the sugar that belongs to an animal origin ?

ⓐ (1) and (2). ⓑ (1) or (2). ⓒ (2) and (3). ⓓ (2) or (3).

20 If you know that during the binding between two glucose molecules, a water molecule is removed, in the light of this, answer :

(1) ✻ What is the molecular formula of a polymer that consists of three glucose molecules ?

ⓐ $C_{18}H_{36}O_{18}$ ⓑ $C_{18}H_{32}O_{16}$ ⓒ $C_{18}H_{30}O_{15}$ ⓓ $C_6H_{10}O_5$

(2) What is the number of water molecules which are resulted from the formation of a polymer consisting of ten monomers ?

ⓐ 1 ⓑ 9 ⓒ 10 ⓓ 20

(3) When forming a complex sugar, 13 water molecules are removed, so how many glucose molecules are attached together ?

ⓐ 12 ⓑ 13 ⓒ 14 ⓓ 15

(4) What is the total number of hydrogen and oxygen atoms that are removed on the formation of a polymer consisting of 5 monomers ?

ⓐ 3 ⓑ 6 ⓒ 12 ⓓ 15

21 From the opposite diagram which expresses a vital process that occurs inside the mitochondria, what does letter (X) represent ?

Glucose
Oxidation
(X)
Activities of the cell

ⓐ Water.
ⓑ Starch.
ⓒ ATP
ⓓ Mineral salts.

22 After the digestion of bread, in which form of the following the body stores the excess of its need from the digestion products ?

ⓐ Cellulose. ⓑ Glycogen. ⓒ Starch. ⓓ Glucose.

23 Study the following figure, then determine :

X
Y

Which statement expresses it better ?

ⓐ (Y) has a molecular weight bigger than (X).
ⓑ (X) is resulted from oxidation reaction.
ⓒ (Y) has the same properties of (X).
ⓓ (X) is resulted from polymerization reaction.

24 Which food substances are advised to reduce their eating to limit the increase in weight ?

ⓐ Carbohydrates. ⓑ Vitamins. ⓒ Mineral salts. ⓓ Proteins.



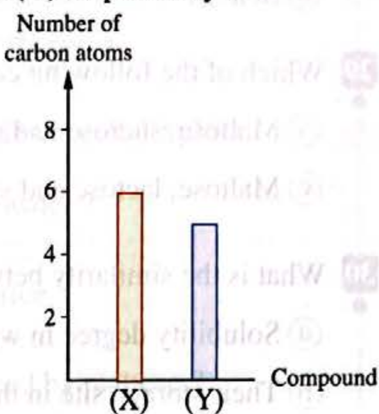
25 The following graph shows the number of carbon atoms in two organic compounds of carbohydrates, which of the following may represent (X) and (Y) respectively ?

ⓐ Fruit sugar / Grape sugar.

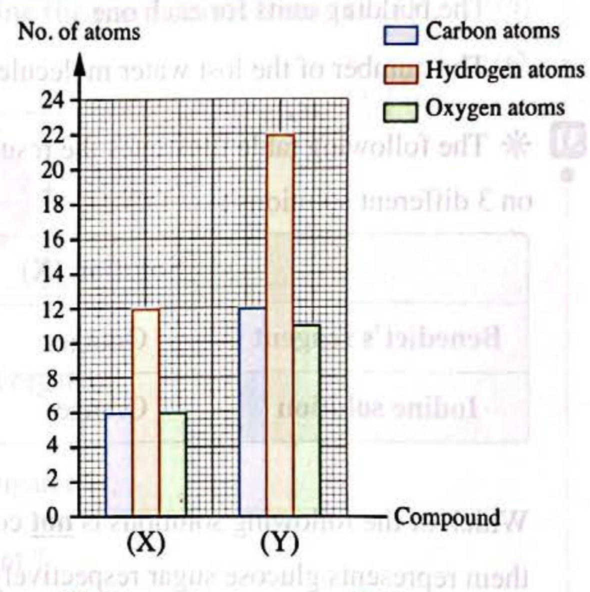
ⓑ Grape sugar / Ribose sugar.

ⓒ Milk sugar / Malt sugar.

ⓓ Cane sugar / Ribose sugar.



26 The opposite graph shows the number of carbon, hydrogen and oxygen atoms in two organic compounds (X) and (Y), study it, then answer :



(1) What is formed on binding many molecules of compound (X) with each other inside the human body ?

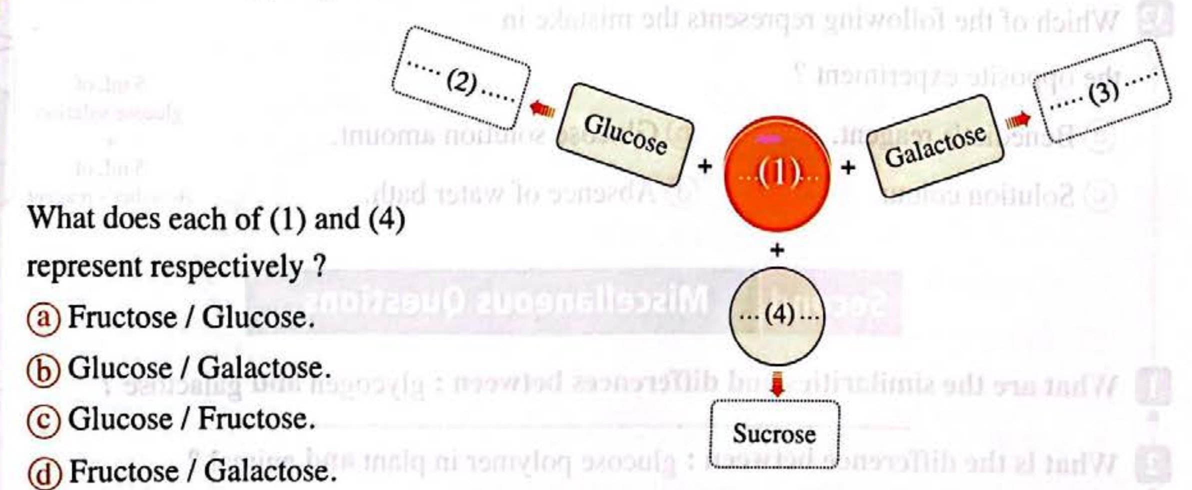
ⓐ Maltose. ⓑ Lactose.

ⓒ Starch. ⓓ Glycogen.

(2) If compound (X) is a part of compound (Y), what is compound (Y) when it is found in sugarcane juice ?

ⓐ Maltose. ⓑ Lactose. ⓒ Fructose. ⓓ Sucrose.

27 From the following diagram :



What does each of (1) and (4) represent respectively ?

ⓐ Fructose / Glucose.

ⓑ Glucose / Galactose.

ⓒ Glucose / Fructose.

ⓓ Fructose / Galactose.

28 Which of the following forms where the monosaccharide is stored in the lion muscles ?

ⓐ Starch. ⓑ Maltose. ⓒ Glycogen. ⓓ Cellulose.

29 Which of the following compounds give identical monomers on their hydrolysis ?

ⓐ Maltose, sucrose and starch. ⓑ Maltose, glycogen and starch.

ⓒ Maltose, lactose and starch. ⓓ Sucrose, maltose and glycogen.

30 What is the similarity between maltose and glycogen ?

ⓐ Solubility degree in water.

ⓑ Their storage site in the cells.

ⓒ The building units for each one.

ⓓ The number of the lost water molecules when forming each one.

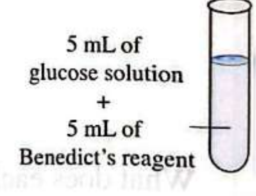
31 ✻ The following table illustrates the results of an experiment that was carried out on 3 different solutions :

	Solution (X)	Solution (Y)	Solution (Z)
Benedict's reagent	Orange	Blue	Blue
Iodine solution	Orange	Orange	Blue

Which of the following solutions is <u>not</u> considered from carbohydrates and which of them represents glucose sugar respectively ?

ⓐ X / Y ⓑ Y / X ⓒ Z / Y ⓓ Y / Z

32 Which of the following represents the mistake in the opposite experiment ?



ⓐ Benedict's reagent. ⓑ Glucose solution amount.

ⓒ Solution colour. ⓓ Absence of water bath.

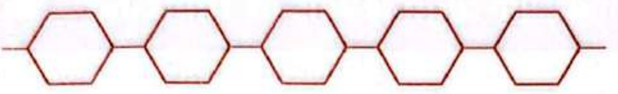
Second Miscellaneous Questions

1 **What are the similarities and differences between :** glycogen **and** galactose ?

2 **What is the difference between :** glucose polymer in plant **and** animal ?



3 **The following diagram illustrates one of the plant sugars, answer the following :**



(a) What is its importance for the plant ?

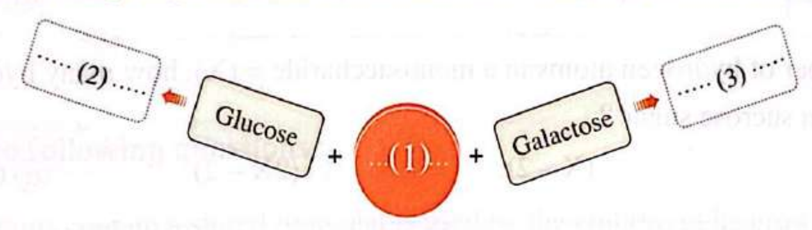
(b) This diagram contributes in the production of energy inside the cell. **Explain.**

4 **What happens when :** adding Benedict's reagent to wheat powder ?

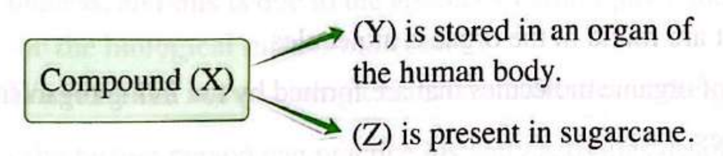
5 **What happens when :** adding iodine solution to the grinded rice ?

6 **What happens if :** the cellulose of plant cell walls was replaced by maltose ?

7 **Study the following diagram, then determine the compounds from (1) : (3).**



8 **From the following diagram :**



What does each of (X) , (Y) and (Z) represent ?

Questions that measure **high levels of thinking**



Choose the correct answer :

1 If you know that binding two molecules of glucose leads to removing a water molecule :

(1) Which of the following represents the molecular formula of a polymer that is formed from the binding of 5 molecules of glucose sugar ?

ⓐ $C_{30}H_{60}O_{30}$ ⓑ $C_{30}H_{32}O_{16}$ ⓒ $C_{30}H_{52}O_{26}$ ⓓ $C_{30}H_{58}O_{30}$

(2) What is the number of water molecules that are resulted from the formation of 5 maltose molecules ?

ⓐ 9 ⓑ 5 ⓒ 4 ⓓ 1

2 If the number of hydrogen atoms in a monosaccharide = (X), how many hydrogen atoms are found in sucrose sugar ?

ⓐ (X). ⓑ (X – 2). ⓒ (2X – 2). ⓓ $(X^2 + 2)$.

3 Which of the following whose difference represents the reason for the variation of living organisms from each other ?

ⓐ The chemical elements that are found in the organic molecules.
ⓑ The types and the quantity of organic molecules that are formed by the living organism.
ⓒ The organic molecules' sizes.
ⓓ The types of inorganic molecules.

4 What is the direct source of energy in muscles when a person walks for short distances ?

ⓐ Starch. ⓑ Glycogen. ⓒ Glucose. ⓓ ATP

5 Which of the following enters in the structure of newspapers and books ?

ⓐ Ribose. ⓑ Cellulose. ⓒ Starch. ⓓ Glycogen.

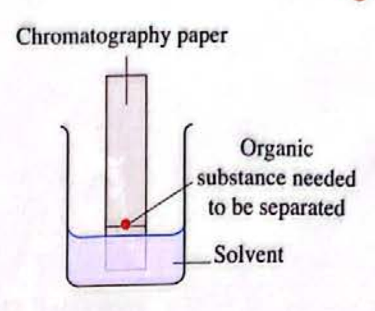
6 From the equation : $ATP \underset{\text{Storing energy}}{\overset{\text{Releasing energy}}{\rightleftharpoons}} ADP + P$

What is the correct sequence of the energy production pathway in a plant cell ?

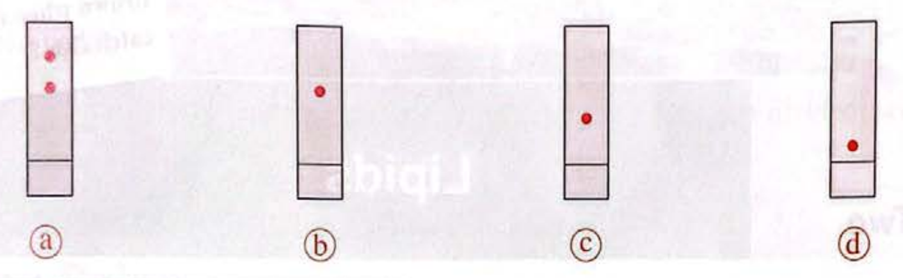
ⓐ Glycogen ⟶ Glucose ⟶ ATP ⟶ Energy.
ⓑ Glucose ⟶ Starch ⟶ ATP ⟶ Energy.
ⓒ Energy ⟶ Glucose ⟶ ATP ⟶ Energy.
ⓓ Glucose ⟶ Energy ⟶ ATP ⟶ Energy.



7 If you know that the chromatography is a technique used to separate the organic molecules, based on their molecular weight and degree of their solubility by using a certain solvent, the opposite figure illustrates an experiment to separate the components of four different sugars which are starch, cellulose, maltose and sucrose separately, by using chromatography.



In the light of this, which of the following figures contains digestive products of sucrose sugar ?



Answer the following questions :

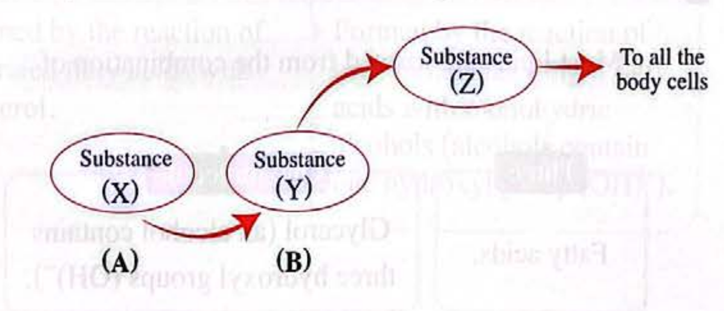
8 The corn grains contain a stored food that is used by the embryo in its growth and differentiation under the soil surface, as the embryo can't perform the photosynthesis process, and this is due to the absence of chlorophyll and light. **In the light of your study for the biological macro-molecules :**

What are the stored biological macro-molecules in the grain ?

9 (The fasting person can practice his daily activities despite the long periods of fasting). **Explain this statement in the light of your study.**

10 Each of cotton threads and linen threads are used in the manufacture of clothes that contain water insoluble polymers, **determine** these polymers, then **conclude** from which type of biological macro-molecules the cotton and linen threads are formed.

11 If you know that figure (A) represents a plastid storing a polymer in a potato tuber, figure (B) represents a mitochondrion in a muscular cell, and (X), (Y) and (Z) are substances used by the cells in the vital processes, **what do these substances represent ?**



Why do you think, aquatic birds don't drown when they catch fish ?

Chapter 1

Lesson Two

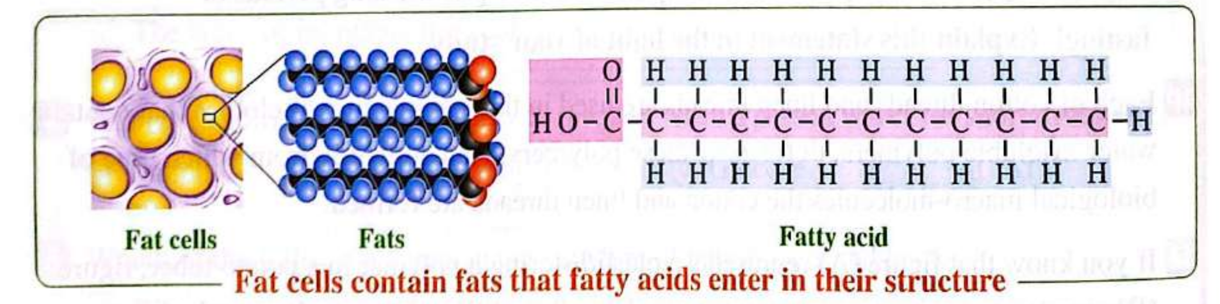
Lipids

Lipids

They are biological macro-molecules (polymers) that are made up of many smaller molecules (monomers) called fatty acids, and consist of a large group of heterogeneous compounds.

- They consist of carbon (C), hydrogen (H) and oxygen (O) atoms "indefinite proportions".
- **The solubility of lipids :**

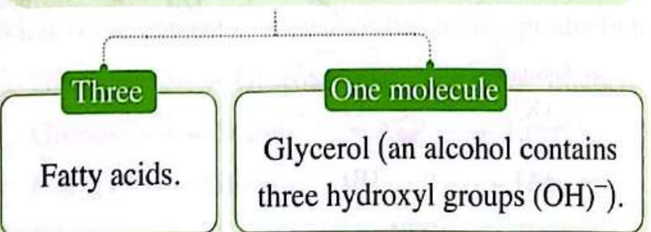
  Lipids are insoluble in polar solvents such as water, but they are soluble in non-polar solvents such as benzene and carbon tetrachloride.



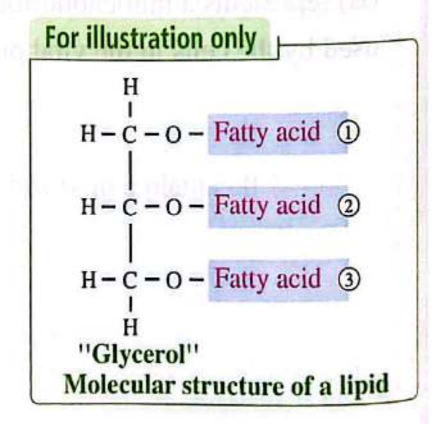
Fat cells contain fats that fatty acids enter in their structure

Molecular structure of lipids

Most lipids are formed from the combination of :



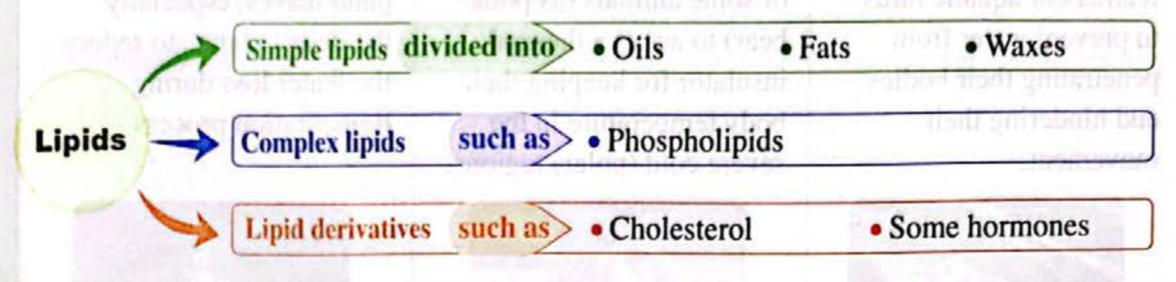
For illustration only



Molecular structure of a lipid

Classification of lipids

- **Lipids are classified, according to their chemical structure, as follows :**



1 Simple lipids

- They are formed by the reaction of fatty acids with alcohols. **They are divided, according to :**

The saturation degree of fatty acids and The type of alcohols

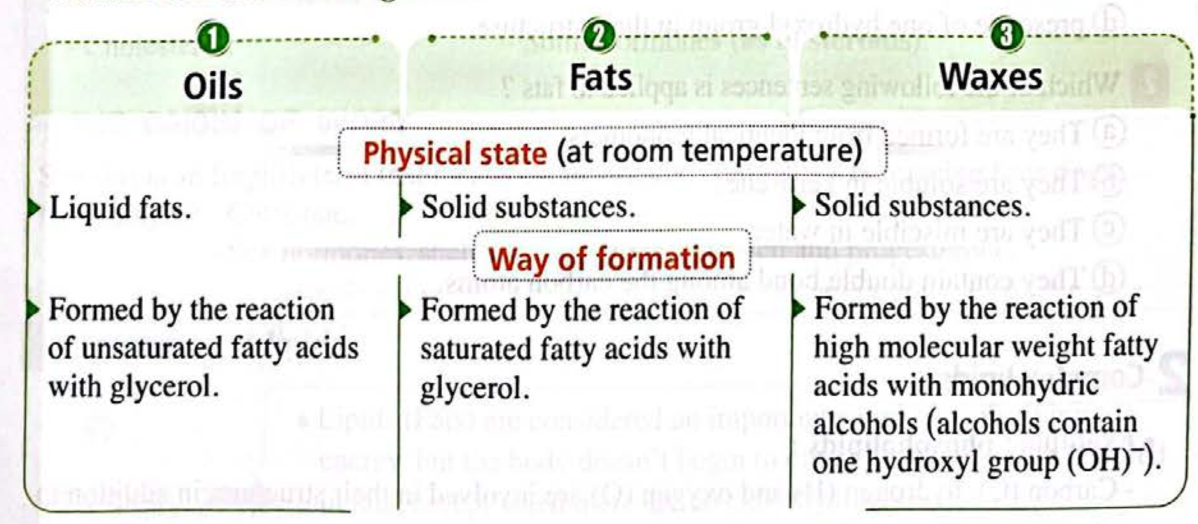
Key Points

Fatty acids are divided according to their degree of saturation :

- **Saturated fatty acids :** They contain single covalent bonds only among the carbon atoms in the acid molecule.
- **Unsaturated fatty acids :** They contain single and double covalent bonds among the carbon atoms in the acid molecule.

Therefore, the number of hydrogen atoms linked with carbon atoms in the unsaturated fatty acids is less than that of the saturated fatty acids.

As shown in the following table :



	① Oils	② Fats	③ Waxes
Physical state (at room temperature)	Liquid fats.	Solid substances.	Solid substances.
Way of formation	Formed by the reaction of unsaturated fatty acids with glycerol.	Formed by the reaction of saturated fatty acids with glycerol.	Formed by the reaction of high molecular weight fatty acids with monohydric alcohols (alcohols contain one hydroxyl group $(OH)^-$).

Examples

- The oils that cover the feathers of aquatic birds to prevent water from penetrating their bodies and hindering their movement.



Feathers of aquatic birds

- Fats stored under the skin of some animals (as polar bear) to act as a thermal insulator for keeping their body temperature in the severe cold (polar) regions.



Polar bear

- The wax that covers the plant leaves, especially the desert plants, to reduce the water loss during transpiration process.



Wax covering the plant leaves

Biology in our daily life

- Ready meals, fried food, many bakeries and sweets contain a type of fats called trans fats that are produced by the hydrogenation of vegetable oils. Eating a lot of these fats leads to increasing the cholesterol level in blood, causing harms to human health.



Test yourself



Choose the correct answer :

1 Waxes and fats are similar in the ....

ⓐ number of (C), (O) and (H) atoms that are present in each of them.

ⓑ type of fatty acids in each one of them.

ⓒ presence of three hydroxyl groups in their structure.

ⓓ presence of one hydroxyl group in their structure.

2 Which of the following sentences is applied to fats ?

ⓐ They are formed from identical monomers.

ⓑ They are soluble in kerosene.

ⓒ They are miscible in water.

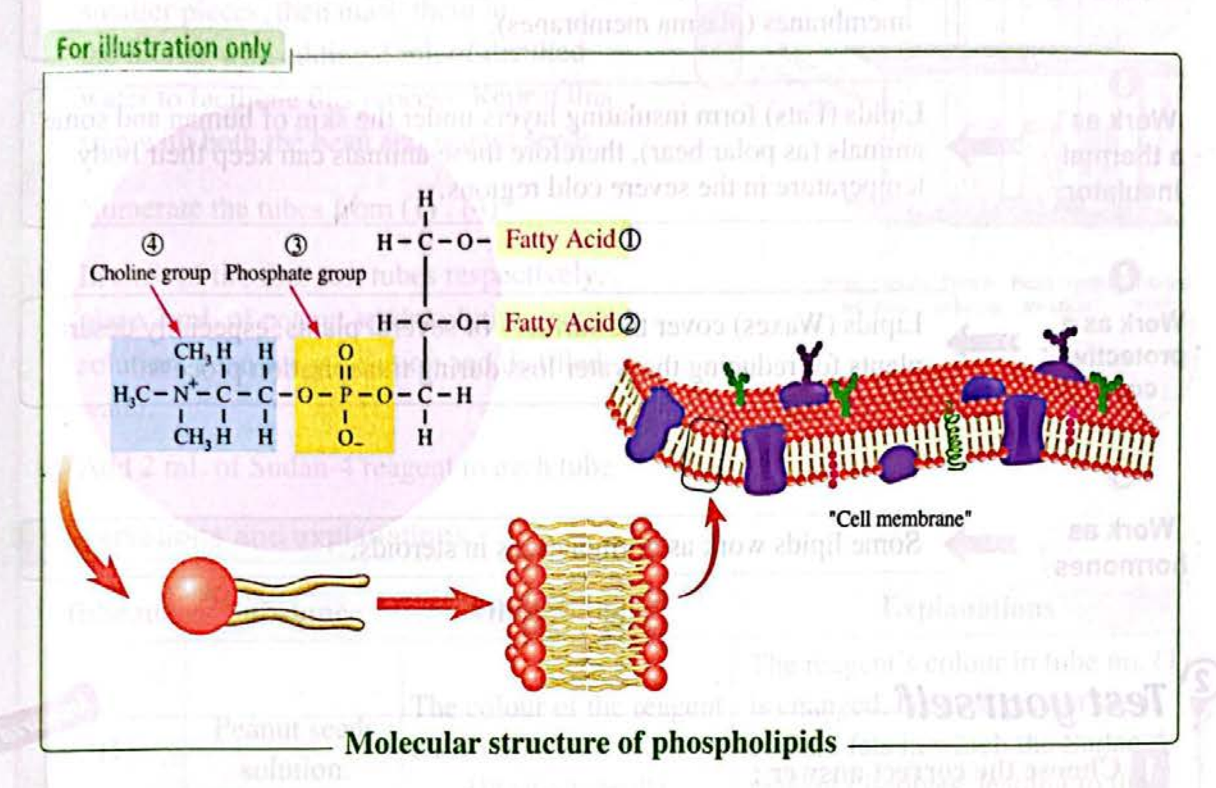
ⓓ They contain double bond among the carbon atoms.

2 Complex lipids

- **Example : phospholipids :**
  - Carbon (C), hydrogen (H) and oxygen (O) are involved in their structure, in addition to phosphorus (P) and nitrogen (N).
  - They are present in the cell membranes of animal and plant cells.

- **Their molecular structure :** it is similar to the structure of fat molecules with replacing the third fatty acid in fats by a phosphate group and choline group.
  i.e. it consists of two fatty acids, phosphate group $(PO_4)^{3-}$, choline group and glycerol molecule.

For illustration only



Molecular structure of phospholipids

3 Lipid derivatives

- They are derived from both the simple and complex lipids by hydrolysis (a reaction occurs by adding water).
- **From their examples :**
  - Cholesterol.
  - Some hormones **(as in steroids).**

THE ORIGIN OF WORD

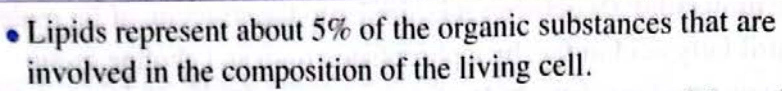
Steroids is an English term that means cyclic organic compounds containing four rings, for example : - Cortisone.
- Sex hormones, such as testosterone, estrogen and progesterone.

Importance of lipids



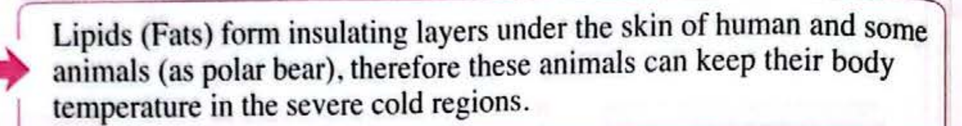
- Lipids (Fats) are considered an important source for obtaining energy, but the body doesn't begin to obtain the energy that is stored in fats, except when there are no carbohydrates.
- The amount of energy gained from lipids is more than the amount of energy gained from the same quantity of carbohydrates.





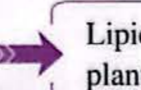
- Lipids represent about 5% of the organic substances that are involved in the composition of the living cell.
- Lipids (Phospholipids) are involved in the structure of the cell membranes (plasma membranes).





Lipids (Fats) form insulating layers under the skin of human and some animals (as polar bear), therefore these animals can keep their body temperature in the severe cold regions.





Lipids (Waxes) cover the surfaces of several plants, especially desert plants for reducing the water loss during transpiration process.



Work as hormones



Some lipids work as hormones, as in steroids.

2 Test yourself



1 Choose the correct answer :

Phospholipids share the molecules of fats in containing ....

ⓐ a phosphate group and a choline group.

ⓑ a molecule of glycerol and a saturated fatty acid.

ⓒ a phosphate group and a molecule of glycerol.

ⓓ a choline group and an unsaturated fatty acid.

2 Arrange the following molecules according to the speed of obtaining energy from them : (Glycogen / Sucrose / Fats / Glucose).

....



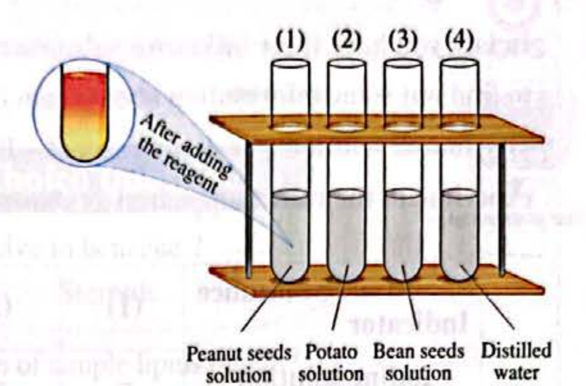
Practical Activity 3 — Detection of lipids



1. Used materials and tools :

- 4 Test tubes. - Potatoes. - Bean seeds. - Peanut seeds.
- Distilled water. - Mortar. - 4 Pipettes. - Sudan-4 reagent.
- Adhesive paper. - Tube rack.

2. Procedure :



1. Cut a small piece of the potato into very smaller pieces, then mash them in the mortar with adding 2 mL of distilled water to facilitate this process. Repeat this step with both the bean and peanut seeds.
2. Numerate the tubes from (1) : (4).
3. In each of the four test tubes respectively, place 2 mL of peanut seeds solution, potato solution, bean seeds solution and distilled water.
4. Add 2 mL of Sudan-4 reagent to each tube.

3. Observations and explanations :

Tube no.	Substance	Observations	Explanations
(1)	Peanut seeds solution.	The colour of the reagent turns red. (Positive result)	The reagent's colour in tube no. (1) is changed, because peanut seeds contain fats in which the Sudan-4 reagent dissolves, leading to the change of its colour into red.
(2)	Potato solution.	The reagent's colour doesn't change. (Negative result)	The reagent's colour doesn't change in the three tubes, because they don't contain fats.
(3)	Bean seeds solution.		
(4)	Distilled water.		

4. Conclusion :

Sudan-4 reagent is used for detecting fats in different foodstuff.

Integration with chemistry 

Sudan-4 reagent is a reddish brown pigment which dissolves in fats, used to dye lipids and it has an important role in studying cells.

Life application :

Sudan-4 reagent is used to detect fats in various foodstuff, **such as** oils, milk and peanut butter, **because** it is a stain that is soluble in fats, where it turns red in their presence.



Test yourself



In lab, you have three unknown substances (1), (2) and (3), where you were asked to find out some information about them by using some available indicators which are (Iodine solution – Sudan-4 reagent – Benedict's reagent), and after finishing the experiment, the results appeared as shown in the following table, study it, then answer :

Indicator \ Substance	(1)	(2)	(3)
Iodine solution	–	–	+
Sudan-4 reagent	+	–	–
Benedict's reagent	–	+	–

–	Negative result
+	Positive result

Choose the correct answer :

1 Which of the following represents substances (1), (2) and (3) respectively ?

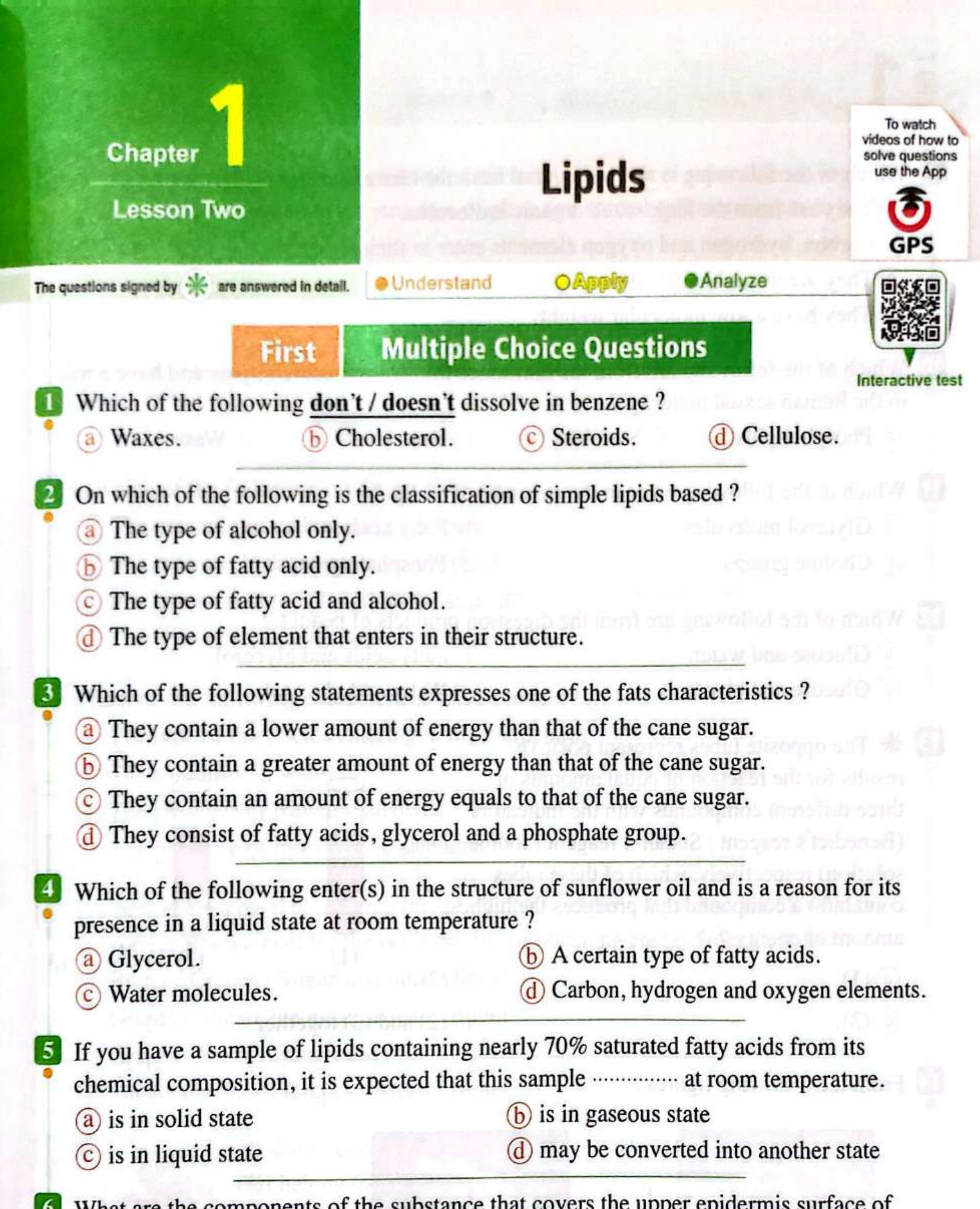
ⓐ Starch / Glucose / Fats. ⓑ Fats / Glucose / Starch.

ⓒ Fats / Starch / Glucose. ⓓ Glucose / Fats / Starch.

2 Which of the following is/are considered the simplest organic molecule(s) ?

ⓐ (1) only. ⓑ (2) only.

ⓒ (1) and (2) together. ⓓ (2) and (3) together.



Lipids

To watch videos of how to solve questions use the App GPS

The questions signed by ✱ are answered in detail. ● Understand ● Apply ● Analyze

Interactive test

First Multiple Choice Questions

1 Which of the following **don't / doesn't** dissolve in benzene ?

ⓐ Waxes. ⓑ Cholesterol. ⓒ Steroids. ⓓ Cellulose.

2 On which of the following is the classification of simple lipids based ?

ⓐ The type of alcohol only.
ⓑ The type of fatty acid only.
ⓒ The type of fatty acid and alcohol.
ⓓ The type of element that enters in their structure.

3 Which of the following statements expresses one of the fats characteristics ?

ⓐ They contain a lower amount of energy than that of the cane sugar.
ⓑ They contain a greater amount of energy than that of the cane sugar.
ⓒ They contain an amount of energy equals to that of the cane sugar.
ⓓ They consist of fatty acids, glycerol and a phosphate group.

4 Which of the following enter(s) in the structure of sunflower oil and is a reason for its presence in a liquid state at room temperature ?

ⓐ Glycerol. ⓑ A certain type of fatty acids.
ⓒ Water molecules. ⓓ Carbon, hydrogen and oxygen elements.

5 If you have a sample of lipids containing nearly 70% saturated fatty acids from its chemical composition, it is expected that this sample .... at room temperature.

ⓐ is in solid state ⓑ is in gaseous state
ⓒ is in liquid state ⓓ may be converted into another state

6 What are the components of the substance that covers the upper epidermis surface of *Opuntia* plant ?

ⓐ Saturated fatty acids and glycerol. ⓑ Unsaturated fatty acids and glycerol.
ⓒ High molecular weight fatty acids and monohydric alcohols.
ⓓ High molecular weight fatty acids and glycerol.

7 Which of the following lipids **don't** contain glycerol ?

ⓐ Oils. ⓑ Phospholipids. ⓒ Waxes. ⓓ Fats.

8 ✱ What is the number of fatty acids that are found in 10 molecules of phospholipids ?

ⓐ 5 ⓑ 10 ⓒ 15 ⓓ 20

9 Which of the following is <u>not</u> considered from the characteristics of steroids ?

ⓐ They are from the large-sized organic molecules.
ⓑ Carbon, hydrogen and oxygen elements enter in their structure.
ⓒ They are insoluble in water.
ⓓ They have a low molecular weight.

10 Which of the following are from the hormones that are considered lipids and have a role in the human sexual maturity ?

ⓐ Phospholipids. ⓑ Steroids. ⓒ Fats. ⓓ Waxes.

11 Which of the following enter in the structure of all lipids ?

ⓐ Glycerol molecules. ⓑ Fatty acids.
ⓒ Choline groups. ⓓ Phosphate groups.

12 Which of the following are from the digestion products of peanut ?

ⓐ Glucose and water. ⓑ Fatty acids and glycerol.
ⓒ Glucose and glycerol. ⓓ Water and glycerol.

13 ✱ The opposite tubes represent positive results for the reaction of equal amounts of three different compounds with the indicators (Benedict's reagent / Sudan-4 reagent / Iodine solution) respectively, which of these tubes contain(s) a compound that produces the highest amount of energy ?

(1) (2) (3)

ⓐ (1). ⓑ (2).
ⓒ (3). ⓓ (2) and (3) together.

14 From the following figures :



(1)

(2)



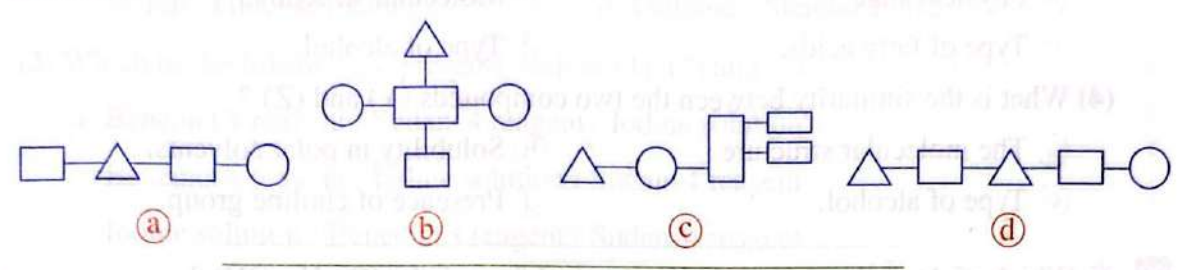
(3)

Which of the following represents the lipid that is present in each of (1), (2) and (3) respectively ?

ⓐ Fats / Oils / Oils. ⓑ Fats / Oils / Fats.
ⓒ Oils / Oils / Fats. ⓓ Oils / Fats / Oils.



15 By using the following shapes, which of the following choices represents an organic molecule that is present in the structure of plant and animal cell membranes in high amount ?



16 In which of the following oil differs from fat ?

ⓐ The presence of carbon and hydrogen.

ⓑ It is common in the animal than the plant.

ⓒ It is common in the plant than the animal.

ⓓ The type of alcohol that enters in its structure.

17 Which of the following characterizes fats from oils ?

ⓐ The type of fatty acids entering in their structure.

ⓑ The solubility in water.

ⓒ The presence of trihydric alcohols.

ⓓ The presence of monohydric alcohols.

18 If a person ate a meal containing (bread - butter - grapes - sugarcane juice), what is the correct arrangement for the cell's priority of obtaining energy from these foods ?

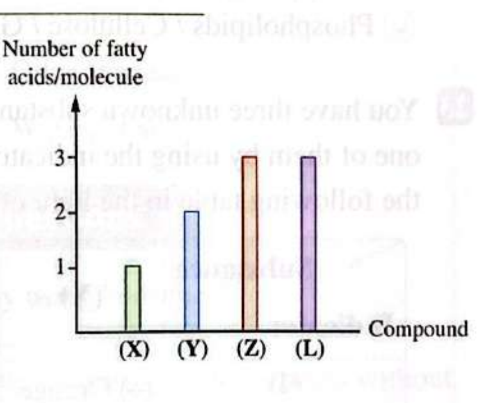
ⓐ Butter / Grapes / Sugarcane juice / Bread.

ⓑ Grapes / Sugarcane juice / Bread / Butter.

ⓒ Grapes / Bread / Sugarcane juice / Butter.

ⓓ Sugarcane juice / Grapes / Bread / Butter.

19 The opposite graph shows compounds (X), (Y), (Z) and (L) that belong to the same type of biological macro-molecules and are soluble in carbon tetrachloride, study it, then answer :



(1) Which compound coats the surface of cactus ?

ⓐ (X). ⓑ (Y).

ⓒ (Z). ⓓ (L).

(2) Which compound contains phosphorus element ?

ⓐ (X). ⓑ (Y).

ⓒ (Z). ⓓ (L).

(3) ✳ Which of the following is considered a similarity between the two compounds (Z) and (L) ?

ⓐ Physical state. ⓑ Molecular structure.
ⓒ Type of fatty acids. ⓓ Type of alcohol.

(4) What is the similarity between the two compounds (Y) and (Z) ?

ⓐ The molecular structure. ⓑ Solubility in polar solvents.
ⓒ Type of alcohol. ⓓ Presence of choline group.

20 ✳ Which of the following could its chemical formula be ($C_{27}H_{45}OH$) ?

ⓐ Glycogen. ⓑ Phospholipid. ⓒ Cholesterol. ⓓ Starch.

21 ✳ Which of the following is/are not resulted from the hydrolysis of simple and complex lipids ?

ⓐ Cholesterol. ⓑ Testosterone hormone.
ⓒ Estrogen hormone. ⓓ Phospholipids.

22 Three complex compounds (X), (Y) and (Z) :

- Compound (X) is present in the plant cell wall, and consists of a large number of glucose molecules.
- Compound (Y) is present in the cell membrane, and the elements (C, H, O, P & N) enter in its structure.
- Compound (Z) is present in the muscles and liver cells of human, and consists of a large number of glucose molecules.

Which of the following represents each of (X), (Y) and (Z) respectively ?

ⓐ Glycogen / Cellulose / Phospholipids. ⓑ Cellulose / Phospholipids / Glycogen.
ⓒ Phospholipids / Cellulose / Glycogen. ⓓ Cellulose / Glycogen / Phospholipids.

23 You have three unknown substances (X), (Y) and (Z), and it is required to identify each one of them by using the indicators (1), (2) and (3), and the results were as shown in the following table in the light of your study, answer :

Indicator \ Substance	(X)	(Y)	(Z)
(1)	(+) Orange	(–) Blue	(–) Blue
(2)	(–) Orange	(+) Blue	(–) Orange
(3)	(–)	(–)	(+) Red

(+)	Positive result
(–)	Negative result

(1) Which of the following represents each of (X), (Y) and (Z) respectively ?

ⓐ Lipid / Glucose / Starch.
ⓑ Glucose / Lipid / Starch.
ⓒ Starch / Glucose / Lipid.
ⓓ Glucose / Starch / Lipid.

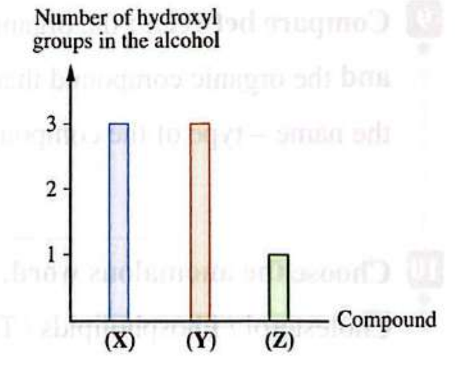
(2) Which of the following represents each of (1), (2) and (3) respectively ?

ⓐ Benedict's reagent / Sudan-4 reagent / Iodine solution.
ⓑ Benedict's reagent / Iodine solution / Sudan-4 reagent.
ⓒ Iodine solution / Benedict's reagent / Sudan-4 reagent.
ⓓ Sudan-4 reagent / Benedict's reagent / Iodine solution.

(3) Which of the following represents what happens on adding water to each of substances (X), (Y) and (Z) respectively ?

ⓐ Doesn't dissolve / Dissolves / Dissolves.
ⓑ Dissolves / Doesn't dissolve / Dissolves.
ⓒ Doesn't dissolve / Dissolves / Doesn't dissolve.
ⓓ Dissolves / Doesn't dissolve / Doesn't dissolve.

24 ✻ The opposite graph illustrates the number of hydroxyl groups in the alcohols that enter in the structure of organic compounds (X), (Y) and (Z), if you know that (Y) and (Z) have the same physical state, while (X) differs from them, study the graph, then answer :



Which of the following represents each of (X), (Y) and (Z) respectively ?

ⓐ Oils / Fats / Waxes.
ⓑ Fats / Oils / Waxes.
ⓒ Waxes / Fats / Oils.
ⓓ Oils / Waxes / Fats.

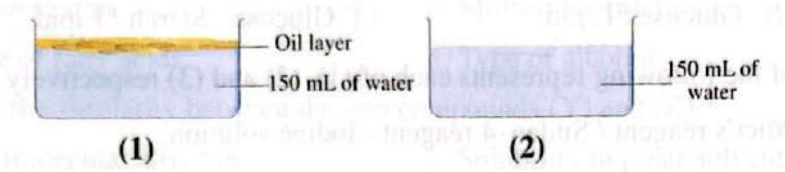
Second Miscellaneous Questions

1 **Give reason for :** some wall paintings are removed by using benzene.

2 Sometimes the spots on clothes are cleaned up by using benzene, and sometimes without benzene. **Explain this.**

3 **What happens in case of :** the absence of waxy substance that coats *Opuntia* plant ?

4 **The two following containers (1) and (2) have been exposed to Sun for 3 hours, what happens to the amount of water in (1) and (2), after this period ? With explanation.**



5 **Compare between :** the substance that coats the cactus leaves **and** the substance that is stored under the human skin.

6 **(Fats / Phospholipids / Oils / Waxes), from the previous words :**

(a) If the odd word was "Phospholipids", **write what links the rest.**

(b) If the odd word was "Waxes", **write what links the rest.**

7 **Give reason for :** penguin can live in polar regions, while hawk can't live in the same regions.

8 "Cholesterol may be produced from phospholipids". **How far is this statement correct ? With explanation.**

9 **Compare between :** the organic compound that is stored in this figure **and** the organic compound that coats its surface, "**according to :** the name – type of the compound – solubility".



10 **Choose the anomalous word, then mention what links the rest :**

Cholesterol / Phospholipids / Testosterone hormone / Progesterone hormone.

11 **What happens when :** consuming most of the glucose and glycogen in the human body, when performing a vigorous effort ?

12 "The amount of energy that the body gained on digesting 3 g of animal fats equals the amount of energy that the body gained on digesting 3 g of rice".

How far is this statement correct ? With explanation.

13 "The reduction in eating food rich in carbohydrates helps in getting rid of the fats stored in the body". **How far is this statement correct ? With explanation.**



14 **Write what the statement indicates :** "A substance gives red colour with the solution of sesame powder".

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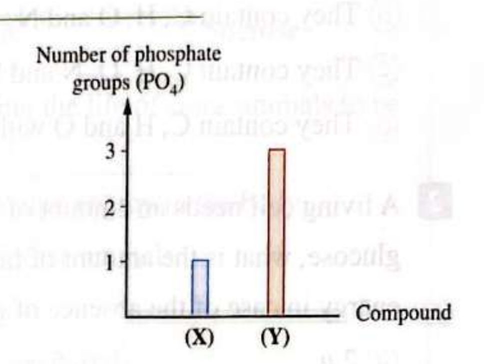
15 **Re-arrange the following molecules from the fastest to the slowest one, "according to providing the living organism's body with the energy needed to perform vital activities" :**

(10 molecules of glycogen – 15 molecules of glucose – 5 molecules of fats)

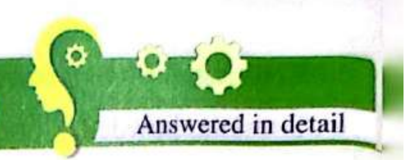
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16 **The opposite graph illustrates the number of phosphate groups (PO_4) in a molecule for two compounds (X) and (Y) in a cell,**

What does each of (X) and (Y) represent ?



Questions that measure **high levels of thinking**



Choose the correct answer :

1. Which of the following sentences describes the lipids better ?
   - ⓐ They contain C, H and O with ratio 1 : 2 : 1
   - ⓑ They contain C, H, O and N
   - ⓒ They contain C, H, O, N and P
   - ⓓ They contain C, H and O with indefinite ratio.

2. A living cell needs an amount of energy equals (X) resulting from the oxidation of 5 g of glucose, what is the amount of fatty acids that the cell needs to get the same amount of energy in case of the absence of glucose ?
   - ⓐ 2 g
   - ⓑ 5 g
   - ⓒ 10 g
   - ⓓ 15 g

3. If you know that the complete oxidation of glucose molecule produces 38 ATP molecules, how many ATP molecules are resulted from the complete oxidation of a fatty acid molecule ?
   - ⓐ 28
   - ⓑ 30
   - ⓒ 38
   - ⓓ More than 38

Answer the following question :

4. To decrease weight (the obesity treatment), it is advised to reduce eating high-fat diets, in the light of your study. **Explain this.**

Test on Chapter 1 

Chemical Structure of Living Organisms' Bodies (Carbohydrates and Lipids)

First | Choose the correct answer (1 : 14)

1 What is the result from combining many molecules of grape sugar ?

ⓐ Lactose. ⓑ Cellulose. ⓒ Maltose. ⓓ Sucrose.

2 Which of the following assures the lipids role in keeping the life of some animals to be able to adapt with different environmental conditions ?

ⓐ Lipids are considered an important source for obtaining energy in the body.

ⓑ The stored fats that are present beneath the skin of some animals.

ⓒ Lipids enter in the structure of the cell membranes.

ⓓ Lipids enter in the structure of some hormones, as in steroids.

3 What is the similarity between water and glucose ?

ⓐ They contain carbon. ⓑ They contain nitrogen.

ⓒ They contain oxygen. ⓓ They contain phosphorus.

4 Which of the following represent foodstuff containing saturated fatty acids, and foodstuff containing unsaturated fatty acids respectively ?

ⓐ Condensed cream / Full-cream yoghurt.

ⓑ Sesame grains / Condensed cream.

ⓒ Condensed cream / Olive fruits.

ⓓ Sesame grains / Full-cream yoghurt.

5 The following table shows the elements that enter in the formation of 4 chemical compounds, which of these compounds represents an inorganic compound ?

Chemical compound	Oxygen	Phosphorus	Carbon	Hydrogen	Nitrogen
ⓐ	✓	✓	✓	✓	–
ⓑ	✓	–	✓	✓	✓
ⓒ	–	–	✓	✓	–
ⓓ	✓	–	–	✓	✓

6 How far are these statements "all lipids contain fatty acids", "but not all of them contain glycerol molecules" correct ?

ⓐ The two statements are correct and related.

ⓑ The two statements are correct and not related.

ⓒ The first statement is correct and the second statement is wrong.

ⓓ The first statement is wrong and the second statement is correct.

7 Why do the living cells use first carbohydrates as a source of energy than lipids ?

ⓐ Because the calorie content of carbohydrates is greater than that of lipids.

ⓑ Because the living cells can't store carbohydrates.

ⓒ Because the energy can be extracted from carbohydrates easily.

ⓓ Because carbohydrates have no other use, except the production of energy.

8

Compound (Y) ← In the plant cell wall — X — Oxidation inside the cells → Molecules (Z)

From the previous diagram, which of the following represents (X), (Y) and (Z) respectively ?

ⓐ Glycogen, glucose and cellulose.

ⓑ Glucose, cellulose and ATP.

ⓒ ATP, glucose and cellulose.

ⓓ Cellulose, glycogen and glucose.

9 Which of the following represents a monomer that enters in the structure of plant fibers from which papers are made ?

ⓐ Starch.

ⓑ Glucose.

ⓒ Cellulose.

ⓓ Sucrose.

10 What is the reason for the difference of simple lipids in their physical state at room temperature ?

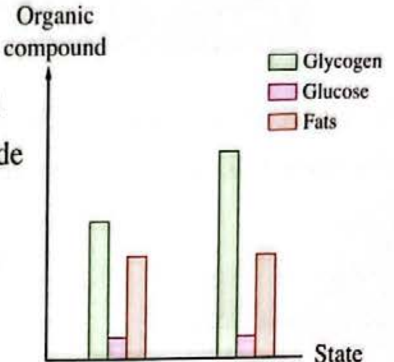
ⓐ The difference in the type of alcohol that they contain.

ⓑ The difference in the type of fatty acids that form them.

ⓒ The difference in the number of carbon atoms.

ⓓ The difference in the number of phosphate groups they have.

11 The opposite graph shows the amount of each of glycogen, glucose and fats in the humerus muscle, where (X) represents the muscle during exercises and (Y) represents the muscle at rest, what do you conclude from this graph ?



ⓐ The muscle consumes glycogen during exercises.

ⓑ The muscle stores fats at rest.

ⓒ The muscle consumes glycogen at rest.

ⓓ The muscle consumes fats during exercises.

---

12 Which of the following is from the adaptations that help the desert plants to maintain their life, especially in drought season ?

ⓐ The presence of a layer of phospholipids in their cell membranes.

ⓑ The presence of a thick waxy layer that covers their leaves.

ⓒ The presence of glycogen molecules stored in their cells.

ⓓ The presence of a large number of mitochondria inside their cells.

---

13 Why do sex hormones belong to lipids and **don't** belong to simple sugars ?

ⓐ Because they contain glycerol.

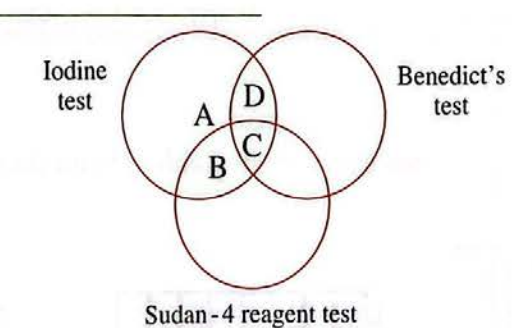
ⓑ Because they have a high molecular weight.

ⓒ Because they are soluble in non-polar solvents.

ⓓ Because they are responsible for the appearance of secondary sex characters.

---

14 The opposite figure illustrates the results of the test of 4 solutions containing different organic compounds, which one contains starch and fats only ?



ⓐ A ⓑ B

ⓒ C ⓓ D

Second Answer the following questions (15 , 16)

15 "Phosphoplipids are formed by the combination of three fatty acids and a trihydric alcohol". **How far is this statement correct ? With explanation.**

____

____

____

16 "During detection of some types of carbohydrates in school lab, the biology teacher asked you to identify two unknown powders with white colour that belong to two different types of sugars". **Show how can you identify these substances.**

____

____

____

____

____

What do you think, spider's web is made up of ?

Chapter 2

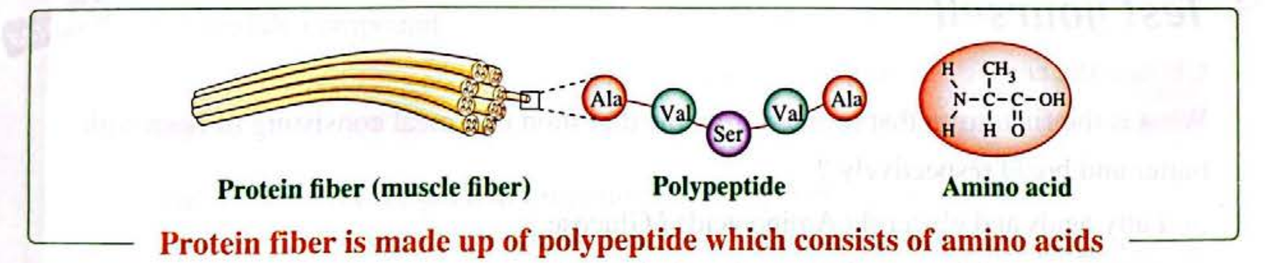
Lesson One

Proteins

Proteins

They are biological macro-molecules (polymers) that are made up of many smaller molecules (monomers) called amino acids.

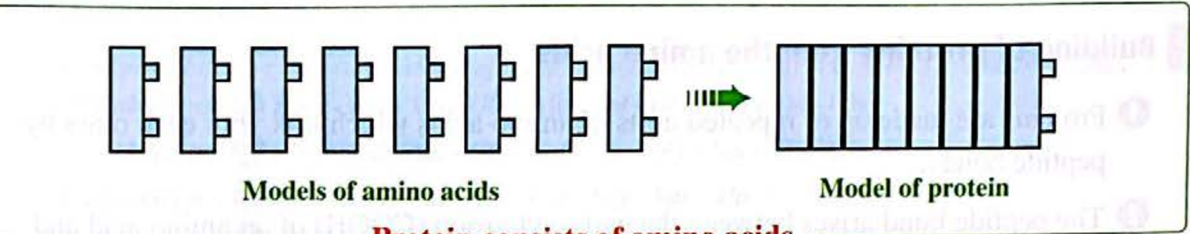
- They consist of carbon (C), hydrogen (H), oxygen (O) and nitrogen (N) atoms.



Protein fiber is made up of polypeptide which consists of amino acids

Molecular structure of proteins

- Proteins have a high molecular weight and are made up of building units which are the amino acids.



Protein consists of amino acids

Amino acids

- Amino acid is the building (structural) unit of the protein, and consists of a **carbon atom** that is attached to :

1. Hydrogen atom (H).
2. Two functional groups which are :
   - A basic amino group (NH_2).
   - An acidic carboxyl group (COOH).
3. An alkyl group (R) which differs from an amino acid to another. So, it determines the type of amino acid.

Hydrogen atom

$$H_2N - \overset{\displaystyle H}{\underset{\displaystyle R}{C}} - COOH$$

Amino group (Basic) — Carboxyl group (Acidic) — Alkyl group

General formula of the amino acid

- From the previous, it is clear that the amino acids are organic compounds that are made up of carbon (C), hydrogen (H), oxygen (O) and nitrogen (N) atoms.

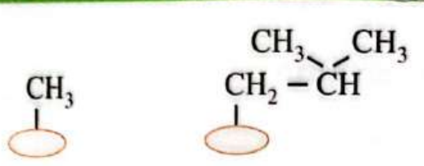
For illustration only

Glycine is the only amino acid that doesn't contain alkyl group (R), where it is replaced by a hydrogen atom.

$$H_2N - \overset{\displaystyle H}{\underset{\displaystyle H}{C}} - COOH$$

Glycine

Integration with chemistry



Alanine | Leucine

Examples for some amino acids, illustrating the different alkyl groups (R) between them

1 Test yourself

Answered

Choose the correct answer :

What is the final form that resulted from the digestion of a meal consisting of bean with butter and bread respectively ?

ⓐ Fatty acids and glycerol / Amino acids / Glucose.

ⓑ Amino acids / Glucose / Fatty acids and glycerol.

ⓒ Glucose / Fatty acids and glycerol / Amino acids.

ⓓ Amino acids / Fatty acids and glycerol / Glucose.

Building of proteins from the amino acids

1. Proteins are made up of repeated units of amino acids which link with each other by peptide bonds.
2. The peptide bond arises between the carboxyl group (COOH) of an amino acid and the amino group (NH_2) of another amino acid through the removal of a water molecule (OH^- group from the carboxyl group of an amino acid and H^+ ion from the amino group of the adjacent amino acid).

For illustration only

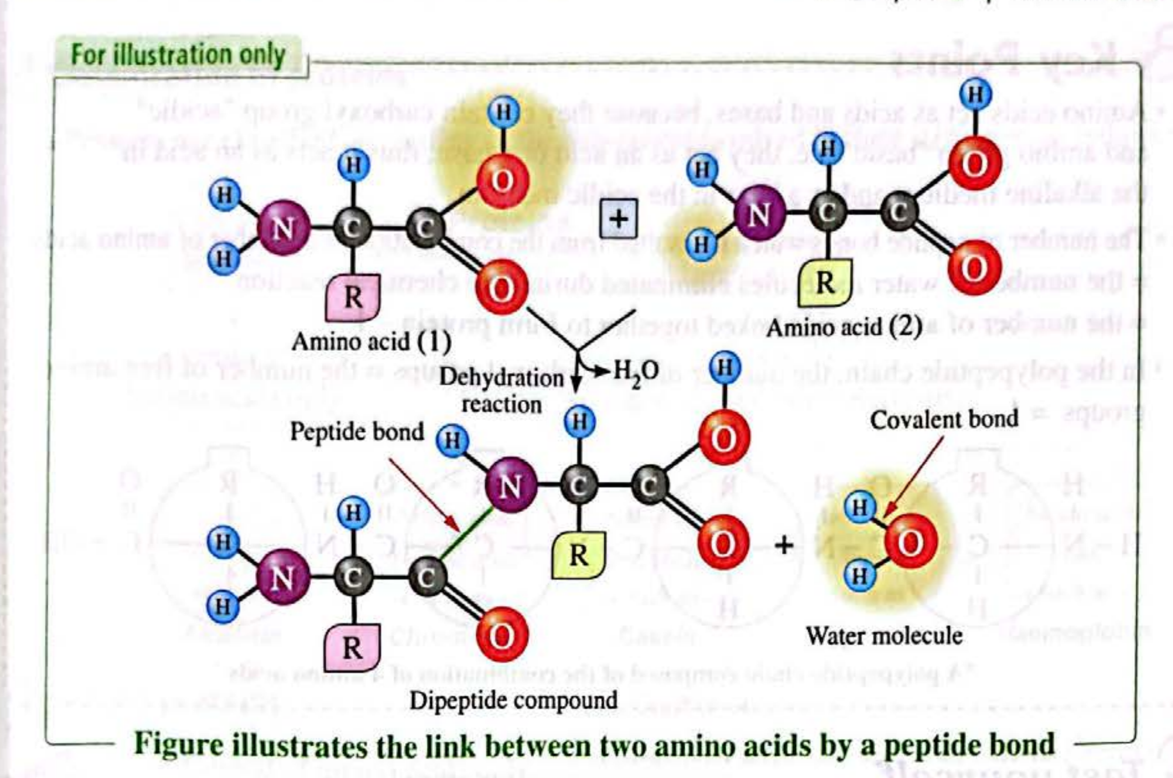
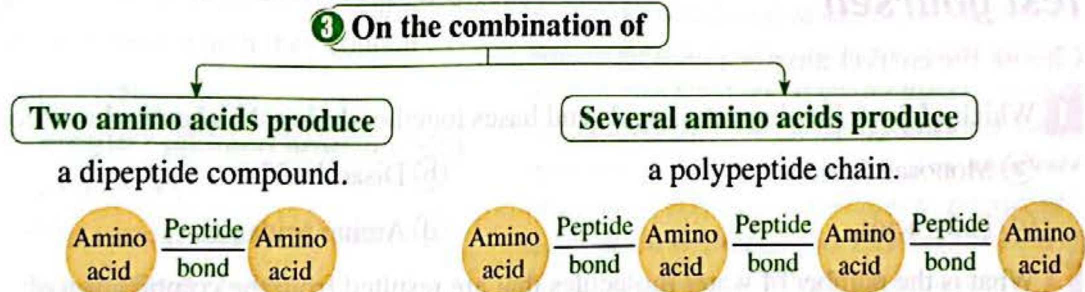


Figure illustrates the link between two amino acids by a peptide bond

3 On the combination of

Two amino acids produce a dipeptide compound.

Several amino acids produce a polypeptide chain.



4 It is not required for the protein formation, the combination among similar amino acids. So, there are extensively wide and various probabilities to form proteins, depending on the **types, order** and **numbers** of amino acids in the polypeptide chain.

Note

There are 20 different types of amino acids that enter in the composition of proteins, such as glycine (Gly), alanine (Ala) and valine (Val) amino acids.

For illustration only

- *Some probabilities of the combination of glycine (Gly), alanine (Ala) and valine (Val) amino acids :*

Probability no. 1 : Gly - Ala - Val - Gly - Ala - Val - Gly - Ala - Val - Gly

Probability no. 2 : Gly - Val - Ala - Gly - Val - Ala - Gly - Val - Ala - Gly

Probability no. 3 : Gly - Gly - Val - Ala - Gly - Gly - Val - Ala - Gly - Gly

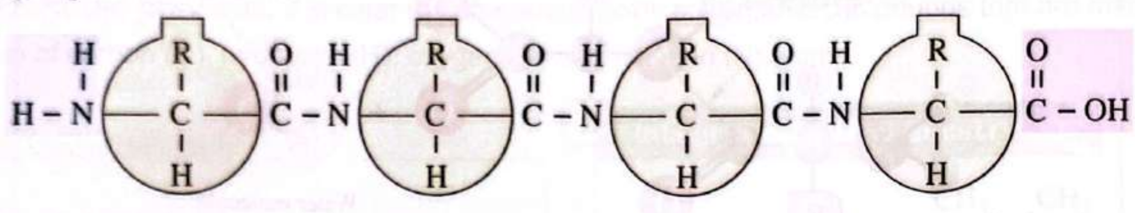
Probability no. 4 : Val - Val - Ala - Ala - Gly - Gly - Val - Val - Ala - Ala

- *The human body can produce 11 types of amino acids which are called by "**Non-essential amino acids**", while the body can't produce the other 9 types and obtain them through the meals which are called "**Essential amino acids**", so that it is necessary to eat foods containing proteins to compensate what the body needs from these amino acids, in order to build your body.*



Key Points

- Amino acids act as acids and bases, because they contain carboxyl group "acidic" and amino group "basic", i.e. they act as an acid or a base, thus it acts as an acid in the alkaline medium and as a base in the acidic medium.
- The number of peptide bonds which is resulted from the combination of a number of amino acids
= the number of water molecules eliminated during the chemical reaction
= the number of amino acids linked together to form protein – 1
- In the polypeptide chain, the number of free carboxyl groups = the number of free amino groups = 1



"A polypeptide chain composed of the combination of 4 amino acids"



Test yourself



Choose the correct answer :

1 Which of the following act as acids and bases together during the chemical reaction ?

ⓐ Monosaccharides. ⓑ Disaccharides.
ⓒ Fatty acids. ⓓ Amino acids.

2 What is the number of water molecules that are resulted from the combination of 5 amino acids with each other ?

ⓐ 10 ⓑ 5
ⓒ 4 ⓓ 1

3 Two similar types of amino acids can form ....

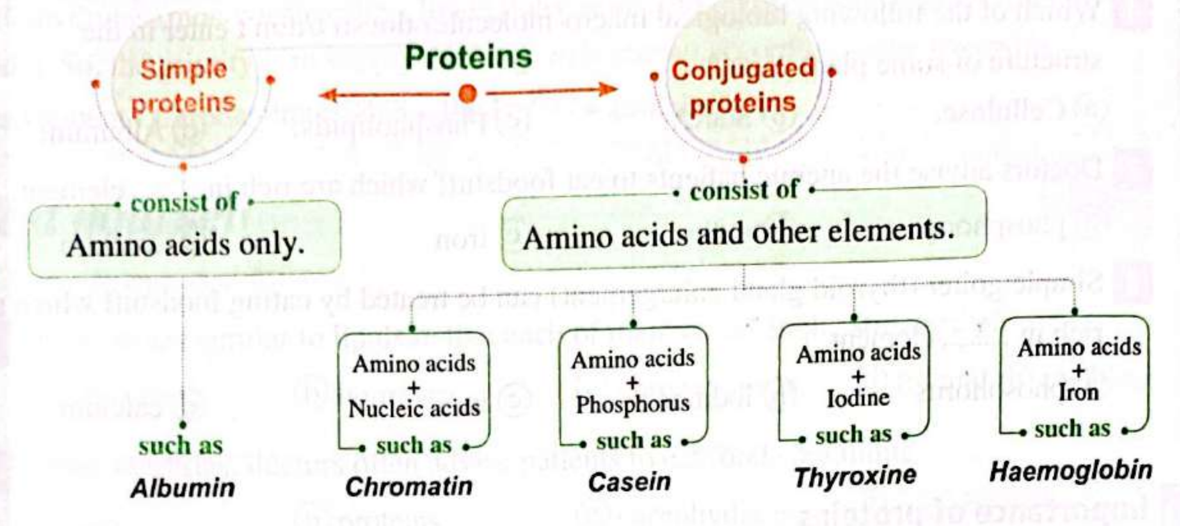
ⓐ dipeptide compound. ⓑ polysaccharide compound.
ⓒ polypeptide compound. ⓓ (a) and (c) together.

4 How many free amino groups are found in the polypeptide chain which is resulted from the combination of 20 amino acids ?

ⓐ 1 ⓑ 10
ⓒ 19 ⓓ 20

Classification of proteins

- **Proteins are classified, according to the substances involved in their structure, as follows :**



1 Simple proteins

- They are formed of amino acids only.
- The elements which they contain :

  C, H, O, N
- **Example : albumin protein which is present in :**
  - Plant leaves, seeds and roots.
  - Human blood plasma.

For illustration only

Albumin protein is synthesized in the liver, and it plays an important role in maintaining the osmotic pressure between the blood and tissues to prevent the leaking of fluids from blood vessels into the tissues. Therefore, its lack in the body leads to the appearance of some symptoms on the patient, as a result of the occurrence of a disorder in maintaining the osmotic pressure of the tissues that makes the body keep large amounts of fluids that causes a swelling in the feet and face.

2 Conjugated proteins

- They are made up of amino acids associated with other elements, such as : **phosphorus, iodine, iron... and others.**
- **Examples :**

	❶ Chromatin	❷ Casein (Milk protein)	❸ Thyroxine (Thyroid gland protein)	❹ Blood haemoglobin (Red blood cells protein)
The amino acids linked with	The nucleic acids (Nucleic proteins)	Phosphorus (Phosphoproteins)	Iodine	Iron
The elements that they contain	**C, H, O, N, P**	**C, H, O, N, P**	**C, H, O, N, I**	**C, H, O, N, Fe**

3 Test yourself

Answered

Choose the correct answer :

1 Which of the following biological macro-molecules doesn't/don't enter in the structure of some plant parts ?

ⓐ Cellulose. ⓑ Starch. ⓒ Phospholipids. ⓓ Albumin.

2 Doctors advise the anemic patients to eat foodstuff which are rich in .... element.

ⓐ phosphorus ⓑ iodine ⓒ iron ⓓ calcium

3 Simple goiter (thyroid gland enlargement) can be treated by eating foodstuff which are rich in .... element.

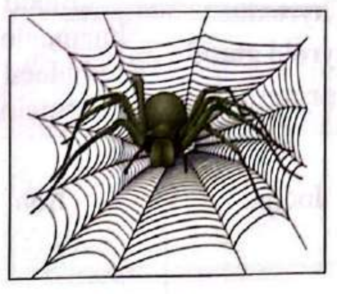
ⓐ phosphorus ⓑ iodine ⓒ iron ⓓ calcium

Importance of proteins

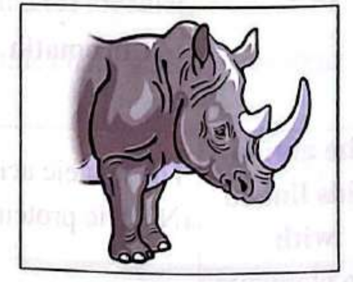
1. Proteins are contributing in the biochemical processes that keep the life and work on its continuity, where they enter in the structure of enzymes and many hormones that stimulate and regulate all the vital functions in the body.
2. They represent the structural unit for all the living organisms, where they enter in the structure and functions of all the living cells, **as they :**
   - Are one of the basic components of the cell membranes and chromosomes.
   - Form the muscles, ligaments, tendons, organs, glands, nails and hair.
   - Enter in the structure of many vital body fluids, such as blood and lymph.
3. They are necessary for the body growth.

Notes

- All enzymes are proteins, but not all hormones are proteins, where some hormones are steroids (derived lipids) as the sex hormones.
- Spider's net, hooves and horns of animals are mainly made up of proteins.


Spider's net


Hooves


Horns

Key Points

The body depends in obtaining energy on the oxidation of digestion products of each of carbohydrates (monosaccharides), lipids (fatty acids and glycerol) and proteins (amino acids). So, the priority is to supply the body with energy according to the following arrangement : Carbohydrates $\xrightarrow{\text{then}}$ lipids $\xrightarrow{\text{then}}$ proteins .



Test yourself



Choose the correct answer :

1. Proteins are similar to lipids in that each of them enters in the structure of ....
   ⓐ enzymes. ⓑ hormones. ⓒ chromosomes. ⓓ (a) and (b) together.

2. After surgeries, doctors often advise patients to eat food containing ....
   ⓐ fats. ⓑ proteins. ⓒ carbohydrates. ⓓ mineral salts.

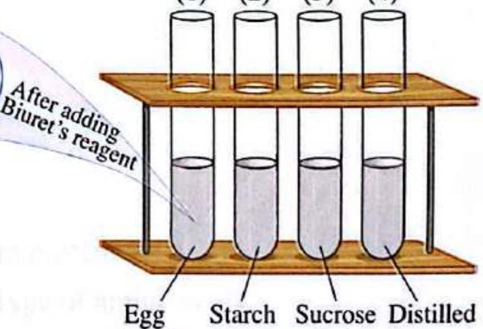
3. Which of the following represents the correct arrangement that the body follows to obtain energy from the following food ?
   ⓐ Peanut / Grapes / Milk / Red meats. ⓑ Milk / Peanut / Grapes / Red meats.
   ⓒ Grapes / Milk / Peanut / Red meats. ⓓ Red meats / Peanut / Milk / Grapes.

Practical Activity 4 — Detection of proteins

1. Used materials and tools :

- Tubes rack.
- 4 test tubes.
- Egg albumin.
- Starch solution.
- Sucrose solution.
- Distilled water.
- Blue Biuret's reagent.

2. Procedure :



1. Label the test tubes from (1) : (4).
2. In the 4 tubes put respectively 2 mL of :
   - Egg albumin.
   - Starch solution.
   - Sucrose solution.
   - Distilled water.
3. Add 2 mL of Biuret's reagent to each tube.

3. Observations and explanations :

Tube no.	Substance	Observations	Explanations
(1)	Egg albumin.	The blue reagent's colour turns violet. (Positive result)	The colour of reagent in tube no. (1) is changed, because egg albumin contains protein that changes the blue colour of Biuret's reagent into the violet colour.
(2)	Starch solution.	The reagent's colour doesn't change. (Negative result)	The colour of reagent is not changed in the three tubes, because they don't contain protein.
(3)	Sucrose solution.		
(4)	Distilled water.		

4. Conclusion :

Biuret's reagent is used for detecting the proteins in various food.

Life application :

Biuret's reagent is used for detecting the presence of protein in urine.

5 *Test yourself*

Answered

Choose the correct answer :

Which of the following can be used in performing urine analysis ?

ⓐ Benedict's and Biuret's reagents.

ⓑ Benedict's reagent and iodine solution.

ⓒ Sudan-4 and Biuret's reagents.

ⓓ Sudan-4 reagent and iodine solution.

Proteins



The questions signed by ✳ are answered in detail. ● Understand ● Apply ● Analyze

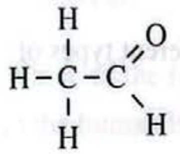


First Multiple Choice Questions

1 Which of the following atoms attach with the terminal groups "valine" amino acid ?

ⓐ Carbon. ⓑ Oxygen. ⓒ Nitrogen. ⓓ Hydrogen.

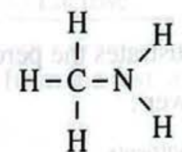
2 Which of the following contains carboxyl group ?



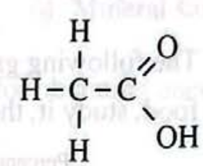
ⓐ

```
H  O  H
|  ‖  |
H−C−C−C−H
|     |
H     H
```

ⓑ



ⓒ



ⓓ

3 What is the number of free carboxyl groups in the polypeptide chain that consists of 4 amino acids ?

ⓐ 1 ⓑ 3 ⓒ 4 ⓓ 5

4 What is the number of peptide bonds that are required to form the polypeptide chain consisting of 8 amino acids ?

ⓐ 4 ⓑ 6 ⓒ 7 ⓓ 8

5 The following figures represent some different proteins that consist of alanine ◯ , valine ▢ and methionine ◇ amino acids, in the light of this, answer :

Protein (1) :

Protein (2) :

Protein (3) :

(1) In which of the following protein (1) differs from protein (3) ?

ⓐ Number of amino acids. ⓑ Type of amino acids.

ⓒ Order of amino acids. ⓓ Number of peptide bonds.

(2) In which of the following protein (2) is similar to protein (3) ?

ⓐ Number of amino acids.
ⓑ Types of amino acids.
ⓒ Order of amino acids.
ⓓ Number of peptide bonds.

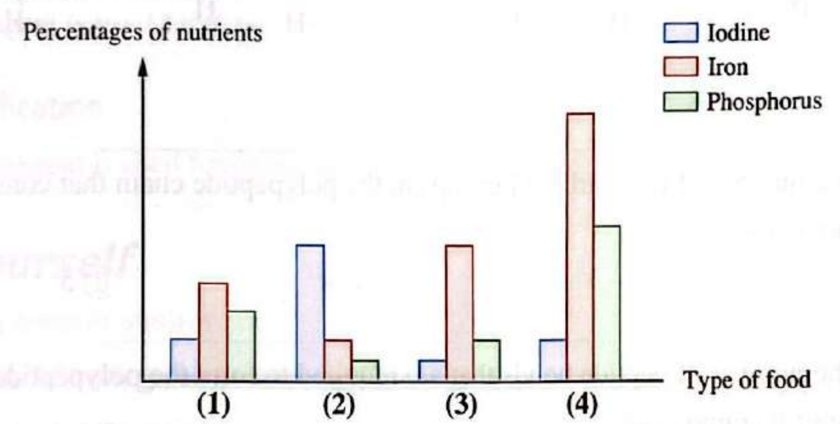
(3) What is the correct arrangement of amino acids in the polypeptide chain no. (1) ?

ⓐ Valine / Alanine / Valine / Methionine / Valine.
ⓑ Valine / Alanine / Methionine / Alanine / Methionine.
ⓒ Valine / Alanine / Valine / Alanine / Methionine.
ⓓ Valine / Alanine / Methionine / Valine / Methionine.

6 Which of the following substances at which the nitrogen element enters in its structure ?

ⓐ Glycogen. ⓑ Galactose. ⓒ Glycine. ⓓ Glucose.

7 The following graph illustrates the percentages of some nutrients in different types of food, study it, then answer :



(1) ✻ Which type of food enters in the structure of RBCs in human ?

ⓐ (1). ⓑ (2). ⓒ (3). ⓓ (4).

(2) Which type of food contributes greatly in the formation of thyroxine hormone ?

ⓐ (1). ⓑ (2). ⓒ (3). ⓓ (4).

8 ✻ What is the number of amino acids in a protein that need 100 water molecules to be digested ?

ⓐ 99 ⓑ 100 ⓒ 101 ⓓ 199

9 ✻ In the opposite figure, if structure (1) loses a hydrogen atom (H^+) when a peptide bond is formed. Which of the following represents two groups (1) and (2) respectively ?

H
(2) – C – (1)
R

ⓐ Amino group / Carboxyl group.
ⓑ Carboxyl group / Amino group.
ⓒ Hydroxyl group / Amino group.
ⓓ Carboxyl group / Hydroxyl group.



10 Which choice in the following table expresses the elements that enter in the structure of protein that is present in the seeds of bean plant ?

	Carbon	Oxygen	Hydrogen	Nitrogen
ⓐ	✓	✓	✓	✓
ⓑ	✓	✓	✓	✗
ⓒ	✓	✓	✗	✗
ⓓ	✗	✗	✓	✓

✓	Present
✗	Absent

11 Which of the following milk components contribute(s) in building the body tissues ?

ⓐ Casein. ⓑ Fats. ⓒ Lactose. ⓓ Mineral salts.

12 Which of the following milk components is/are from the fast sources for obtaining energy in the human body ?

ⓐ Casein. ⓑ Fats. ⓒ Lactose. ⓓ Mineral salts.

13 A person was exposed to an accident that led to the occurrence of a deep wound in his right arm. Which of the following food would help in healing the wound rapidly ?

ⓐ Fresh vegetables and fruits. ⓑ Fresh fruits and rice.
ⓒ Meat and eggs. ⓓ Milk and rice.

14 By using the following symbols, glucose (G) and amino acid (A), which of the following represents a part of pepsin enzyme ?

ⓐ –(A)–(A)–(A)–(A)–(A)–(A)– ⓑ –(A)–(G)–(A)–(G)–(A)–(A)–
ⓒ –(G)–(G)–(A)–(G)–(A)–(G)– ⓓ –(G)–(G)–(G)–(G)–(G)–(G)–

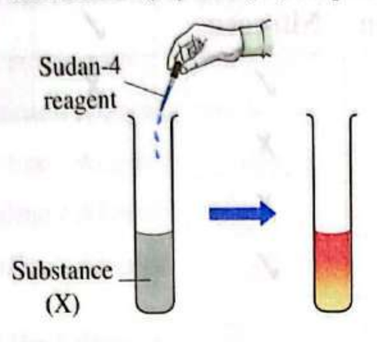
15 Each of hooves and horns consists of different proteins, this is due to the difference in the ………… in their building units.

ⓐ number of water molecules that are present ⓑ alkyl group
ⓒ free carboxyl group ⓓ free amino group

16 * In which of the following Biuret's reagent gives a positive result ?

ⓐ Grape juice. ⓑ Honey.
ⓒ Wheat powder. ⓓ Bean seeds powder.

17 The following figures represent two experiments which are carried out on two unknown food substances (X) and (Y) by using Sudan-4 reagent and Biuret's reagent, what are the two substances (X) and (Y) respectively ?



Experiment (1)

Biuret's reagent

Substance (Y)

Experiment (2)

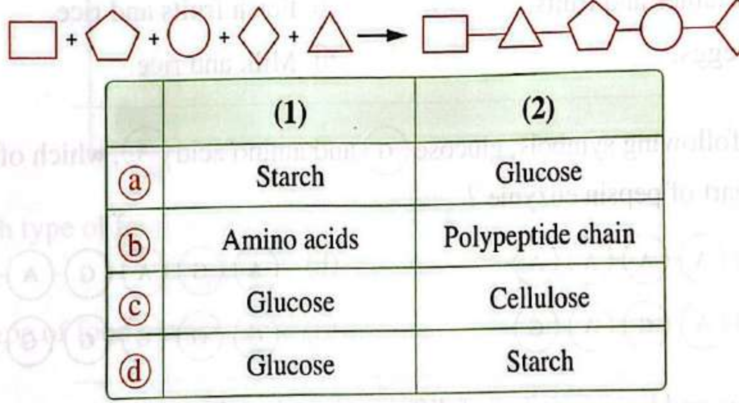
ⓐ Malt powder / Olive oil. ⓑ Malt powder / Wheat powder.

ⓒ Wheat powder / Egg albumin. ⓓ Olive oil / Egg albumin.

18 What is the number of water molecules which are removed when binding 20 amino acids to form a polypeptide chain ?

ⓐ 10 ⓑ 15 ⓒ 19 ⓓ 20

19 By using the following figure, which choice in the following table could express this figure ?



	(1)	(2)
ⓐ	Starch	Glucose
ⓑ	Amino acids	Polypeptide chain
ⓒ	Glucose	Cellulose
ⓓ	Glucose	Starch

20 ✻ Which choice is correct about the biological macro-molecules that the arctic hare (rabbit that lives in the north pole region) can store inside its body ?

	Carbohydrates	Proteins	Lipids
ⓐ	✔	✔	✘
ⓑ	✔	✘	✔
ⓒ	✘	✔	✔
ⓓ	✘	✘	✔



21 The opposite graph represents the normal rates of a conjugated protein in blood, according to the gender and age. If the blood analysis of a child contained 8 mg/dl of that protein, he would suffer from ....

Normal rate according to age

Newborn	Kids	Women	Men
20	12	14	16

ⓐ a deficiency in phosphorus.
ⓑ a deficiency in iron.
ⓒ an increase in iodine.
ⓓ a deficiency in albumin.

22 Which of the following organic molecules is present in all the living organism's cells ?

ⓐ Starch. ⓑ Cellulose.
ⓒ Glycogen. ⓓ Protein.

23 ✻ If we supposed adding an amino acid in a polypeptide chain that forms a certain protein, all the following would occur, <u>except</u> the ....

ⓐ change of protein's type.
ⓑ increase in the number of peptide bonds.
ⓒ loss of a water molecule.
ⓓ difference in the functional group at the terminal of the chain.

24 If we supposed replacing an amino acid in a polypeptide chain that forms a protein with another different amino acid, which of the following would happen ?

ⓐ The protein's type would change.
ⓑ The protein would remain the same.
ⓒ The number of peptide bonds would increase.
ⓓ The number of peptide bonds would decrease.

25 If the meal that you ate yesterday was consisting of rice, red meat, butter and grapes. In the light of this, answer :

(1) Which of the meal components the body stores the excess of it/them in muscles, after its/their digestion ?

ⓐ Rice. ⓑ Butter. ⓒ Grapes. ⓓ Meat.

(2) Which of the meal components is/are used first by the body cells to produce energy ?

ⓐ Rice. ⓑ Grapes. ⓒ Meat. ⓓ Butter.

(3) Which of the meal components is/are used by the body to compensate the damaged tissues after its/their digestion ?

ⓐ Grapes. ⓑ Meat. ⓒ Butter. ⓓ Rice.

26 The following diagram shows a chemical reaction that occurs inside the living organism's cell, in order to synthesis (X) that enters in the building of one of the body tissues, study it, then answer the following :



Which of the following represents the process illustrated in the previous diagram, and the number of (Y) molecules respectively ?

ⓐ Hydrogenation / Four molecules.
ⓑ Polymerization / One molecule.
ⓒ Hydrolysis / Five molecules.
ⓓ Dehydration reaction / Three molecules.

27 On adding Biuret's reagent to the following food substances, which one **doesn't** cause the change of reagent's colour into violet ?

ⓐ A piece of meat. ⓑ Yellow lentils.
ⓒ Honey. ⓓ Broad beans seeds.

28 The following table illustrates what some food substances contain from some organic macro-molecules in grams, by using the data in this table :

Type of food substance	Carbohydrates	Fats	Protein
(1)	10	0.4	9
(2)	48	1.5	0.5
(3)	0	34	25

(1) Which of the following food substances, where the body uses first to obtain energy, after its/their digestion ?

ⓐ (3) only. ⓑ (2) only. ⓒ (1) and (3). ⓓ (2) and (3).

(2) Which of the following food substances share(s) by small percentage in the blood structure, after its digestion ?

ⓐ (1) and (3). ⓑ (2) and (3). ⓒ (2) only. ⓓ (1) only.

(3) Which of the following food substances is(are) **not** stored in the liver, after its/their digestion ?

ⓐ (1) only. ⓑ (3) only.
ⓒ (1) and (2). ⓓ (2) and (3).



(4) Which of the following food substances share(s) greatly in the formation of sex hormones, after its/their digestion ?

ⓐ (1) only. ⓑ (3) only. ⓒ (1) and (2). ⓓ (2) and (3).

Second Miscellaneous Questions

1 **Study the two following compounds**, then deduce, **what** does each of compound (1) and compound (2) represent ?

```
                 H                          H
                 |                          |
          H3C -  C  - CH3                   C = O
                 |                          |
      H - N  -   C  -  C - OH           H - C - OH
          |      |     ||                   |
          H      H     O                H - C - OH
                                            |
                                            H
                (1)                        (2)
```

2 **In the opposite chemical structure, what does each of (1) and (2) represent ?**

```
            H
     O      |       H
      \\    |      /
       [1] - C - [2]
      /     |      \
    HO      R       H
```

3 **Write what this statement indicates :** "Monomer has a dual nature which is acidic nature and basic nature together".

4 **Write what this statement indicates :** "A polymer consists of one type of monomers, but they may be different in the structure".

5 **What happens if :** the alkyl group (R) in the amino acid is replaced by another alkyl group ?

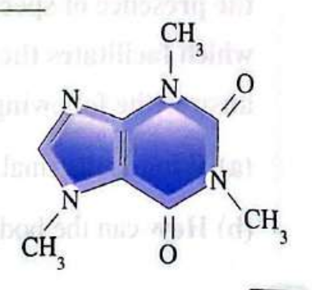
6 **Give reason for :** the alkyl group (R) is the determinant to the type of amino acid.

7 "There is a limited number of protein compounds, due to the presence of 20 types of amino acids". **How far is this statement correct ? With explanation.**

8 **Explain :** the formation of a polypeptide chain is considered a dehydration reaction.

9 **What happens if :** the type of one amino acid is changed in a certain protein ?

10 **Does** the opposite figure represent an amino acid or not ? **Explain your answer.**



11 From the following table, if the two compounds (X) and (Y) are from the same type of biological macro-molecules, **what does each of them represent ?**

Element / Compound	Oxygen	Phosphorus	Nitrogen	Iodine	Iron
(X)	✓	✓	✓	–	–
(Y)	✓	–	✓	–	–

12 **In the light of your study, write what the following statements indicate :**

(a) A polymer that the iodine element enters in its structure.

(b) A polymer that the iron element enters in its structure.

13 "Some plant proteins are identical to the proteins that are present in human".
How far is this statement correct ? With explanation.

14 **What happens if :** the amino acids that form proteins are similar in the order, number and type ?

15 Some individuals suffer from anemia, if you were asked to advise them about the nutrition style. **What** do you advise them in the light of your study ?

16 "The shortage of iodine element in the body causes a disturbance in the thyroid gland".
How far is this statement correct ? With explanation.

17 "The lactating mothers are advised to eat suitable amounts of seafood". **Explain this, knowing that seafood is rich in phosphorus element.**

18 **What is the relation between :** proteins and the animal movement ?

19 The human blood contains a various group of proteins, **mention** two of these proteins, **illustrate the type of each one, and compare between them.**

20 **The process of proteins digestion in human occurs in the digestive system in the presence of specialized enzymes, in order to convert them into their building units which facilitates their absorption and making benefits from them, in the light of this, answer the following :**

(a) What is the final product of this process ?

(b) How can the body cells make benefit from these building units ?



21 **"Egg white contains a polymer that converts the Biuret's reagent colour into violet colour". In the light of your study, answer :**

(a) **What** are the biological macro-molecules to which this polymer belongs ?

(b) If this polymer is present in the plant seeds, **what** is it ? **And what** is its type ?

22 A student added some drops of blue-coloured reagent to a white-coloured powder, then the colour was changed into violet, **what** does this powder represent ? **And what** is the name of this indicator ?

23 You have three types of seeds' extracts, one of them is rich in starch, the second is rich in oils and the third is rich in proteins. **Illustrate how can you differentiate between them.**

Questions that measure **high levels of thinking**

Answered in detail

Choose the correct answer :

1 If you know that the monosaccharides attach with each other by glycosidic bonds by losing a water molecule, therefore the formation of a glycosidic bond is similar to the formation of a peptide bond in the ....

(a) type of polymers that are resulted from each one of them.
(b) type of monomers that are bound by the two bonds.
(c) functional groups that enter in the reaction.
(d) secondary products in both reactions.

---

2 If proteins are classified according to their function, which of the following is considered from the regulatory proteins ?

(a) Thyroxine. (b) Haemoglobin. (c) Casein. (d) Chromatin.

---

3 In order to form a polypeptide of 3 similar amino acids attached to each other, what is the maximum number of the types of the polypeptide chains that can be formed ?

(a) One chain. (b) Two chains. (c) Three chains. (d) Six chains.

---

4 What is the reason for the formation of the opposite chemical compound ?

```
            OH                  CH3
            |                   |
        H   CH2             H  HC - CH3
        |   |               |   |
    H - N - C - C ——————— N - C - C - OH
            |   ||              |   ||
            H   O               H   O
```

(a) Hydrolysis.
(b) Peptide bond formation.
(c) Two fatty acids combination.
(d) Glycosidic bond formation.

---

5 Insulin molecule consists of two polypeptide chains, chain (A) consists of 21 amino acids and chain (B) consists of 30 amino acids, where these two chains bind together by disulphide bonds. What is the number of peptide bonds in insulin molecule ?

(a) 51 bonds. (b) 50 bonds. (c) 49 bonds. (d) 48 bonds.

Answer the following questions :

6 When a shortage in one of the body hormones takes place, the activity of individual decreases, and in order to treat this sluggishness, doctors advise to eat seafood that are rich in iodine element, **deduce the name of this hormone in the light of your study.**

---

7 "Farmers are advised to add the nitrogenous fertilizers to soil on planting beans, where the plant uses them to build the amino acids". **How far is this statement correct ? With explanation.**

Why do you think, every person has his specific fingerprint ?

Chapter 2

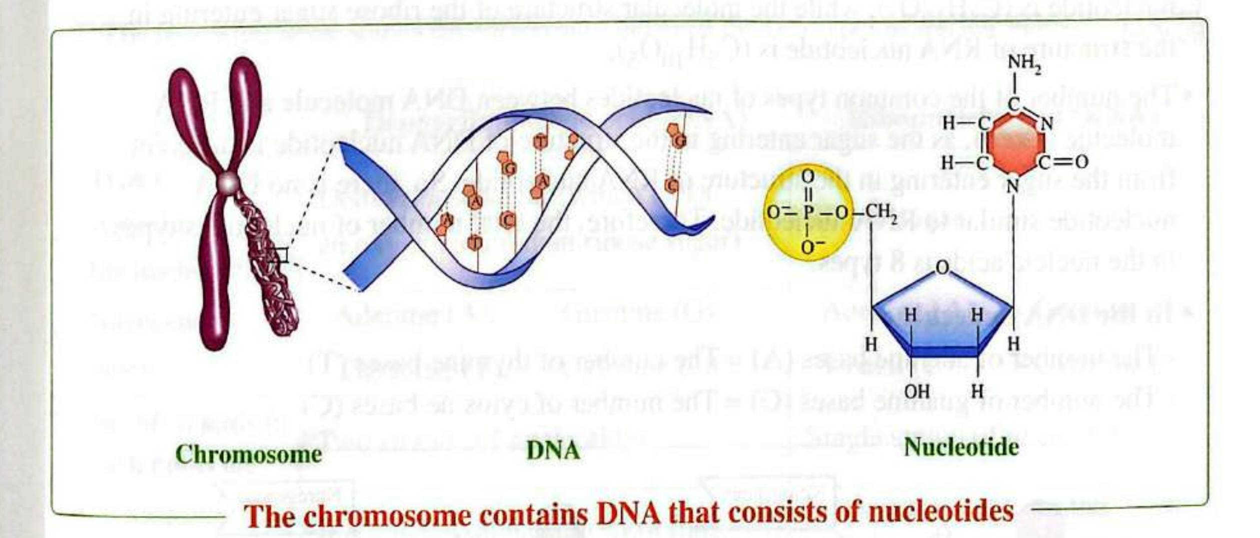
Lesson Two

Nucleic Acids

Nucleic acids

They are biological macro-molecules (polymers) that are made up of many smaller molecules (monomers) called nucleotides.

- They consist of carbon (C), hydrogen (H), oxygen (O), nitrogen (N) and phosphorus (P) atoms.

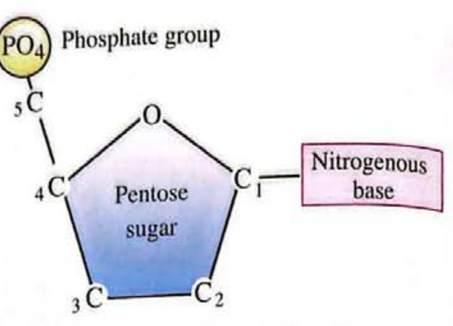


The chromosome contains DNA that consists of nucleotides

Molecular structure of nucleic acids

- Nucleic acids are made up of building units which are the nucleotides that bind together by covalent bonds to form the polynucleotide (nucleic acid).

Nucleotide



Structure of the nucleotide

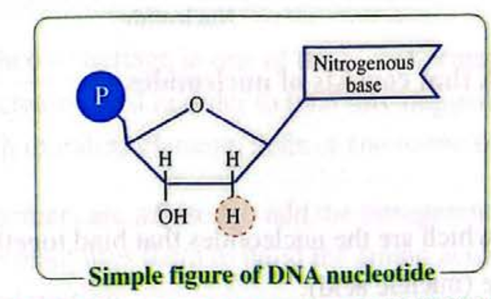
- **It is the basic building unit of the nucleic acid, and consists of three units which are :**

  1. **A molecule of pentose sugar** (consists of five carbon atoms), and there are two main types of sugar, which are :
     - Deoxyribose sugar that enters in the structure of DNA nucleotide.
     - Ribose sugar that enters in the structure of RNA nucleotide.
  2. **Phosphate group :** attaches with the carbon atom no. (5) of sugar molecule by a covalent bond.
  3. **Nitrogenous base :**
     - Attaches with the carbon atom no. (1) of sugar molecule by a covalent bond.
     - Five nitrogenous bases which are :
       Adenine (A), guanine (G), cytosine (C), thymine (T) "in DNA molecule" and uracil (U) is present in RNA molecule instead of thymine.

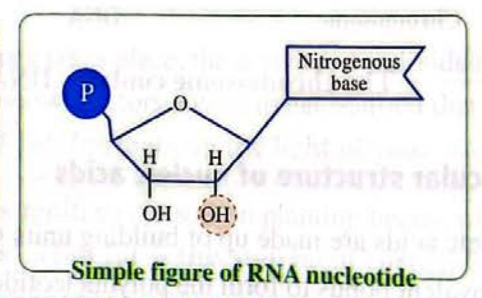
From the previous, it is clear that the nucleic acid DNA differs from the nucleic acid RNA in the type of pentose sugar and one of the nitrogenous bases that forms it.

Key Points

- The nucleic acids, phospholipids and casein protein are similar in the elements' atoms that enter in their structures, which are (C, H, O, N and P).
- The molecular structure of the deoxyribose sugar entering in the structure of DNA nucleotide is ($C_5H_{10}O_4$), while the molecular structure of the ribose sugar entering in the structure of RNA nucleotide is ($C_5H_{10}O_5$).
- The number of the common types of nucleotides between DNA molecule and RNA molecule is **zero**, as the sugar entering in the structure of DNA nucleotide is different from the sugar entering in the structure of RNA nucleotide. So, there is no DNA nucleotide similar to RNA nucleotide. Therefore, the total number of nucleotides types in the nucleic acids is **8** types.
- **In the DNA molecule :**
  - The number of adenine bases (A) = The number of thymine bases (T)
  - The number of guanine bases (G) = The number of cytosine bases (C)



Simple figure of DNA nucleotide



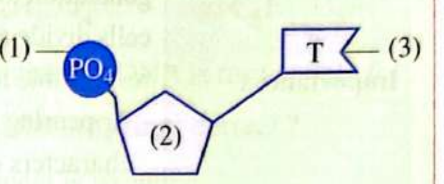
Simple figure of RNA nucleotide

1 Test yourself



1 Choose the correct answer :

(1) The opposite figure illustrates the building unit of DNA nucleic acid, which of the following structures **can't** be found in RNA molecule ?



ⓐ (1) only. ⓑ (3) only.
ⓒ (1) and (2). ⓓ (2) and (3).

(2) Which of the following is/are similar to DNA in the presence of phosphorus element in the structure ?

ⓐ Phospholipids. ⓑ Glycogen.
ⓒ Casein. ⓓ (a) and (c) together.

2 What is the number of common nitrogenous bases that are found between DNA and RNA nucleic acids ?

....

Classification of nucleic acids

- **There are two types of nucleic acids, which are :**

❶ Deoxyribonucleic acid (DNA). ❷ Ribonucleic acid (RNA).



☆ **The following table shows the differences between the two types of nucleic acids :**

P.O.C.	**Deoxyribonucleic acid (DNA)**	**Ribonucleic acid (RNA)**
Type of pentose sugar in the nucleotide :	Deoxyribose sugar (which lacks an oxygen atom than ribose sugar).	Ribose sugar.
Nitrogenous bases :	- Adenine (A). - Guanine (G). - **Thymine (T).** - Cytosine (C).	- Adenine (A). - Guanine (G). - **Uracil (U).** - Cytosine (C).
No. of strands in each molecule :	Two strands of nucleotides.	Single strand of nucleotides.
Site of its presence :	It is carried on the chromosomes inside the cell nucleus.	It is transcribed from the nucleic acid DNA inside the nucleus, then it transfers into the cytoplasm.

Importance :	It carries the genetic information (genes) that is transferred from a generation to another, when the cells divide and thise information is responsible for : - Appearing the distinctive characters of the living organism. - Organizing all the vital activities of the cells.	• It is used in building (synthesizing) the proteins which the cell needs. • These proteins are responsible for : - Appearing the genetic traits. - Organizing the vital activities.
Molecular structure :	C Cytosine G Guanine A Adenine T Thymine DNA	C Cytosine G Guanine A Adenine U Uracil RNA

For illustration only

Bio-computer : *scientists in nanotechnology field reached that it is possible to use the deoxyribonucleic acid (DNA) in making biochips that can be used to make computers much faster than the current devices that rely on silicon chips. Also, their storage capacity will be million times greater than that of the current devices.*

2 Test yourself

Answered

Choose the correct answer :

1 Which of the following contains nitrogen element and enters in the structure of RNA molecule ?

ⓐ Uracil. ⓑ Thymine. ⓒ Ribose. ⓓ Deoxyribose.

2 Which of the following contains nitrogen element and enters in the structure of DNA molecule ?

ⓐ Uracil. ⓑ Thymine. ⓒ Ribose. ⓓ Deoxyribose.

3 What is the molecular formula of deoxyribose sugar ?

ⓐ $C_5H_{10}O_5$ ⓑ $C_6H_{12}O_6$ ⓒ $C_5H_{10}O_4$ ⓓ $C_6H_{12}O_5$

4 How far are these statements "DNA consists of nucleotides", "DNA is responsible for transferring the genetic characters from the parents to the offspring" correct ?

ⓐ The first statement is correct and the second statement is wrong.

ⓑ The two statements are correct and related.

ⓒ The two statements are correct and unrelated.

ⓓ The two statements are wrong.

Chapter 2

Questions on Lesson Two

Nucleic Acids





The questions signed by ✳ are answered in detail. ● Understand ○ Apply ● Analyze

First Multiple Choice Questions

1 ✳ Which choice in the following table is correct ?

	ATP molecule	DNA nucleotide
ⓐ	It contains one phosphate group	It contains two phosphate groups
ⓑ	It contains three phosphate groups	It contains one phosphate group
ⓒ	It is found in human cells only	It is found in all living organisms
ⓓ	It contains peptide bonds	It contains covalent bonds

2 ✳ How many nucleotides types which form the nucleic acids ?

ⓐ 3 ⓑ 4 ⓒ 5 ⓓ 8

3 At which of the following pairs the relation between them is similar to the relation between amino acids and polypeptide respectively ?

ⓐ Nucleotides / Nucleic acid. ⓑ Fats / Fatty acids.

ⓒ Fructose / Starch. ⓓ Glycogen / Glucose.

4 Which of the following represents the carbohydrates in the structure of RNA molecule ?

ⓐ Uracil. ⓑ Ribose. ⓒ Adenine. ⓓ Deoxyribose.

5 What is the number of hydrogen atoms in the sugar that enters in the structure of DNA nucleotide ?

ⓐ 4 ⓑ 5 ⓒ 10 ⓓ 12

6 If you know that the chemical formula of the sugar that enters in the structure of the opposite figure is $C_5H_{10}O_4$, therefore the figure represents the structural unit of ....



ⓐ DNA ⓑ RNA

ⓒ starch. ⓓ nucleic acids.

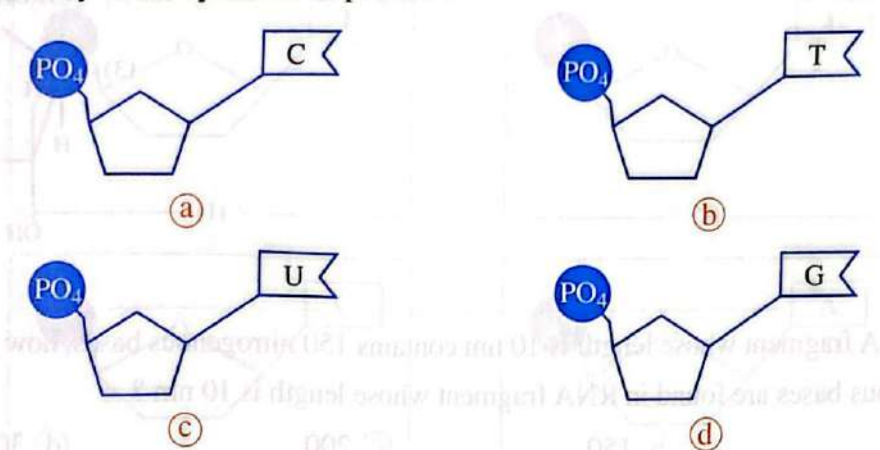
7 Which of the following represents the similarity among nucleotides themselves ?

ⓐ The building structure of sugar. ⓑ The type of nitrogenous base.

ⓒ Phosphate group. ⓓ The nucleic acid that formed from them.



8 Which of the following figures **doesn't** represent a structural unit of the nucleic acid that is used directly in the synthesis of protein ?



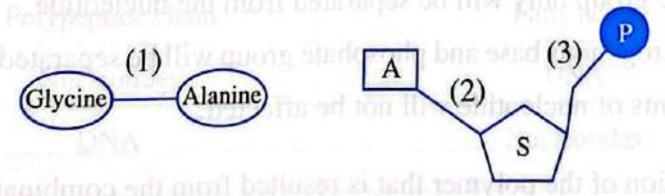
9 Which of the following elements enters in the structure of DNA and thyroxine protein ?

ⓐ Phosphorus. ⓑ Nitrogen. ⓒ Iodine. ⓓ Iron.

10 Which of the following matche(s) DNA in the elements that enter in its structure ?

ⓐ Cellulose. ⓑ Fats. ⓒ Phospholipids. ⓓ Haemoglobin.

11 In the following figures, the numbers represent chemical bonds that bind between the molecules with each other, which of the following represents bonds (1), (2) and (3) respectively ?



ⓐ Peptide / Covalent / Covalent.

ⓑ Covalent / Covalent / Peptide.

ⓒ Covalent / Peptide / Covalent.

ⓓ Peptide / Covalent / Peptide.

12 In which of the following DNA molecule differs from RNA molecule, in the animal cell ?

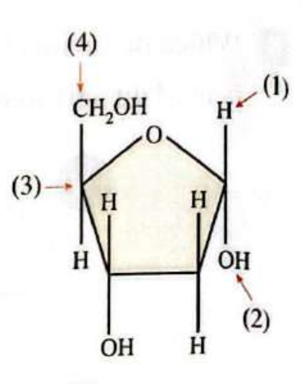
ⓐ DNA consists of a single strand and RNA consists of a double strand.

ⓑ DNA contains 4 types of nucleotides and RNA contains 5 types of nucleotides.

ⓒ DNA is present inside the nucleus and RNA is present in the nucleus and cytoplasm.

ⓓ DNA contains uracil base and RNA contains thymine base.

13 In the opposite figure, which of the following parts binds to the phosphate group in DNA nucleotide ?



ⓐ (1).

ⓑ (2).

ⓒ (3).

ⓓ (4).

---

14 ✱ If DNA fragment whose length is 10 nm contains 150 nitrogenous bases, how many nitrogenous bases are found in RNA fragment whose length is 10 nm ?

ⓐ 75 ⓑ 150 ⓒ 200 ⓓ 300

---

15 The genetic traits are transferred from the parents to the offspring through the ....

ⓐ proteins that are present in the body cells.

ⓑ carbohydrates that are present in the body cells.

ⓒ sequences of nucleotides in RNA

ⓓ sequences of nucleotides in DNA

---

16 A certain enzyme breaks down the covalent bonds that are present in DNA molecule, what happens on treating a nucleotide of DNA with this enzyme ?

ⓐ The nitrogenous base only will be separated from the nucleotide.

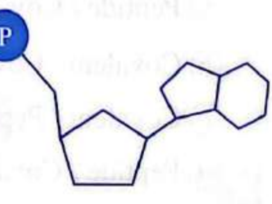
ⓑ The phosphate group only will be separated from the nucleotide.

ⓒ Each of the nitrogenous base and phosphate group will be separated from the nucleotide.

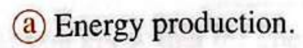
ⓓ The components of nucleotide will not be affected.

---

17 What is the function of the polymer that is resulted from the combination of a number of monomers that one of them illustrated in the opposite figure ?



ⓐ Energy production.



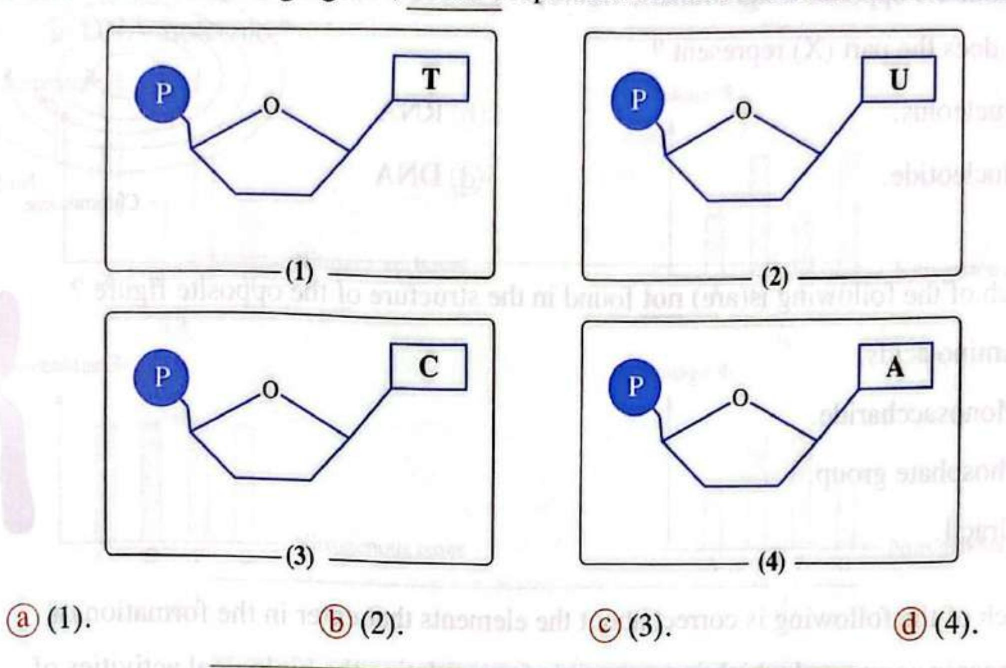
ⓑ Entering in the formation of steroids.

ⓒ Carrying the genetic information of the living organism.

ⓓ Storage of energy.

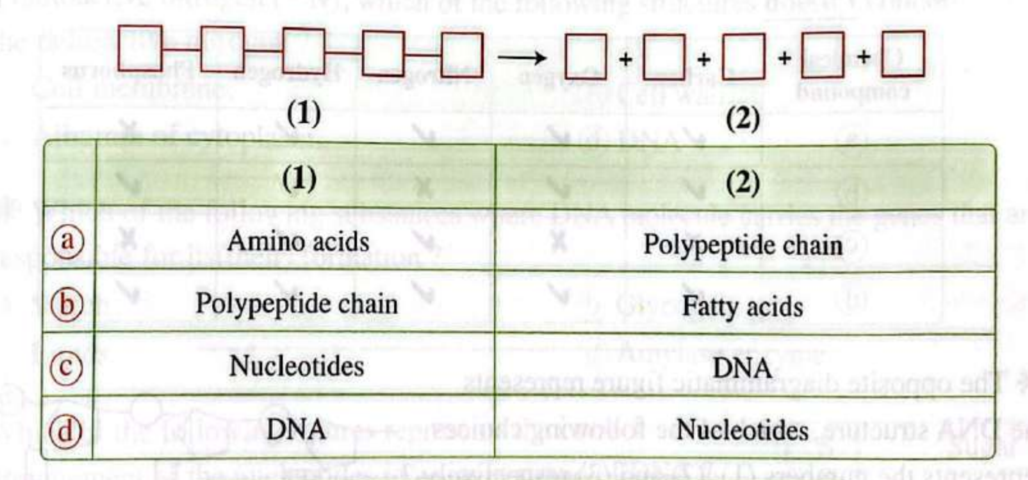


18 Which of the following figures, **doesn't** represent a nucleotide in the nucleic acid DNA ?



ⓐ (1). ⓑ (2). ⓒ (3). ⓓ (4).

19 By using the following diagram, which choice in the following table is correct ?



	(1)	(2)
ⓐ	Amino acids	Polypeptide chain
ⓑ	Polypeptide chain	Fatty acids
ⓒ	Nucleotides	DNA
ⓓ	DNA	Nucleotides

20 ✻ What is the similarity between the nitrogenous base (T) and the nitrogenous base (U) ?

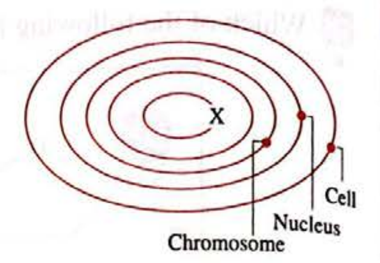
ⓐ The polymer that enters in their structure. ⓑ Structure.

ⓒ Shape. ⓓ Sugar to which it binds.

21 ✻ What is the number of types of nucleotides that are common between DNA molecule and RNA molecule ?

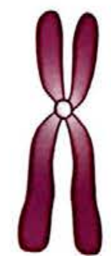
ⓐ Zero. ⓑ 3 ⓒ 4 ⓓ 5

22 ✱ From the opposite diagrammatic figure, what does the part (X) represent ?



ⓐ Nucleolus. ⓑ RNA
ⓒ Nucleotide. ⓓ DNA

23 Which of the following is(are) **not** found in the structure of the opposite figure ?

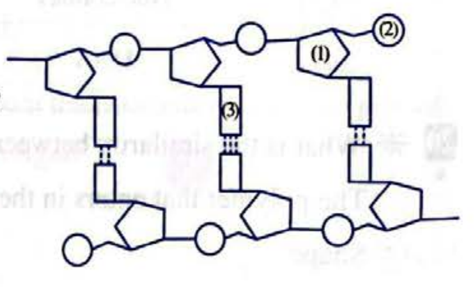


ⓐ Amino acids.
ⓑ Monosaccharide.
ⓒ Phosphate group.
ⓓ Uracil.

24 Which of the following is correct about the elements that enter in the formation of an organic compound which is responsible for regulating the biological activities of the living cell ?

Chemical compound	Carbon	Oxygen	Nitrogen	Hydrogen	Phosphorus
ⓐ	✔	✔	✔	✔	✘
ⓑ	✔	✔	✘	✔	✔
ⓒ	✘	✘	✔	✔	✘
ⓓ	✔	✔	✔	✔	✔

25 ✱ The opposite diagrammatic figure represents the DNA structure, which of the following choices represents the numbers (1), (2) and (3) respectively ?



ⓐ Ribose sugar / Phosphate group / Cytosine.
ⓑ Deoxyribose sugar / Adenine / Phosphate group.
ⓒ Deoxyribose sugar / Phosphate group / Guanine.
ⓓ Ribose sugar / Guanine / Phosphate group.

26 If you know that adenine (A) binds with thymine (T), and guanine (G) binds with cytosine (C) in the double helix of DNA, in the light of this, answer :

(1) At which of the following pairs the percentage is always equal ?

ⓐ Adenine and guanine. ⓑ Thymine and cytosine.
ⓒ Adenine and thymine. ⓓ Guanine and thymine.

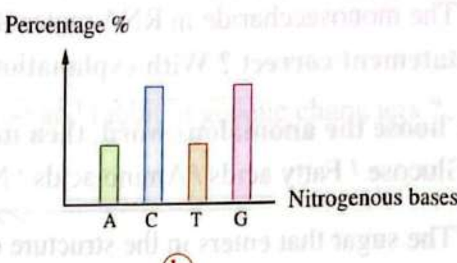


(2) Which of the following graphs <u>**isn't**</u> correct about the percentage of nitrogenous bases in DNA molecule ?

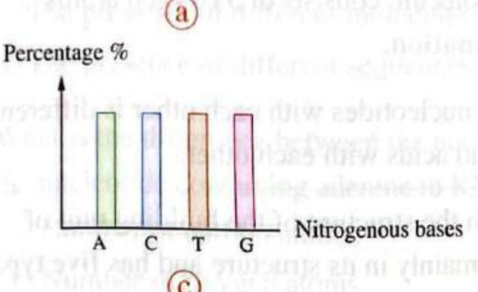
Percentage %

A C T G Nitrogenous bases

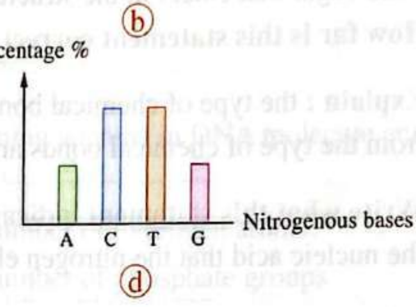
ⓐ



ⓑ



ⓒ



ⓓ

27 ✻ When a living cell from tobacco plant leaf grows in a nutritive medium containing a radioactive nitrogen (^{15}N), which of the following structures <u>**doesn't**</u> contain the radioactive nitrogen ?

ⓐ Cell membrane. ⓑ Cell wall.

ⓒ Albumin of cytoplasm. ⓓ DNA

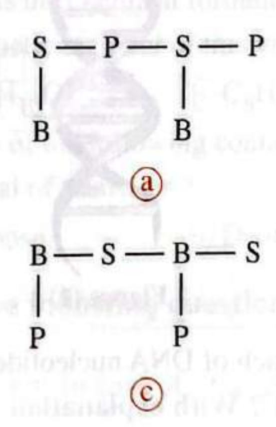
28 ✻ Which of the following substances where DNA molecule carries the genes that are responsible for its(their) formation ?

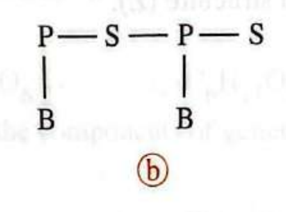
ⓐ Starch. ⓑ Glycogen.

ⓒ Lipids. ⓓ Amylase enzyme.

29 Which of the following figures represents the correct arrangement of the nucleotides in a single strand of DNA ?

S	Sugar
P	Phosphate group
B	Nitrogenous base





B — S — P — B — S — P

ⓓ

Second Miscellaneous Questions

1 "The monosaccharide in RNA molecule is the building unit of starch". **How far is this statement correct ? With explanation.**

2 **Choose the anomalous word, then mention what links the rest :**
Glucose / Fatty acids / Amino acids / Nucleic acids

3 "The sugar that enters in the structure of RNA molecule consists of 5 oxygen atoms". **How far is this statement correct ? With explanation.**

4 **Explain :** the type of chemical bonds among the nucleotides with each other is different from the type of chemical bonds among the amino acids with each other.

5 **Write what this statement indicates :** "A part in the structure of the building unit of the nucleic acid that the nitrogen element enters mainly in its structure and has five types".

6 **What happens if :** several nucleotides are linked together by covalent bonds ?

7 **Explain :** the polynucleotide differs from the polypeptide.

8 **Write what this statement indicates :** "A monomer contains mainly nitrogen and phosphorus elements".

9 **Explain :** the presence of nitrogen element in each of the proteins and nucleic acids.

10 "We can differentiate between the nucleotides containing adenine and guanine in DNA molecule from the shape". **How far is this statement correct ? With explanation.**

11 **In the two opposite figures :**

- **(a)** Structure (X) is different in the two figures (1) and (2), **explain this.**
- **(b) Deduce** the components of each of structure (Y) and structure (Z).

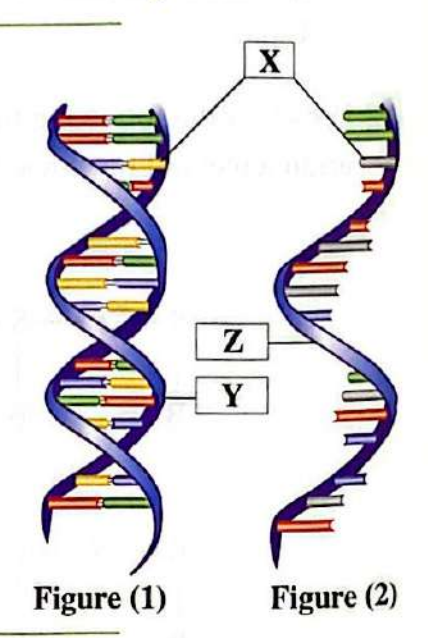
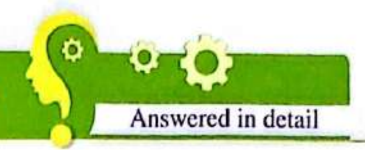


Figure (1) Figure (2)

12 "The number of atoms forming the sugar molecule in each of DNA nucleotide and RNA nucleotide is equal". **How far is this statement correct ? With explanation.**

Questions that measure **high levels of thinking**



Choose the correct answer :

1 What is the reason for the difference between mouse and rabbit in genetic characters ?

ⓐ The presence of different inorganic molecules.

ⓑ The presence of different carbohydrate molecules.

ⓒ The presence of different molecules of lipids.

ⓓ The presence of different sequences of nucleotides.

2 What is the difference between the nucleotide containing adenine in DNA molecule and the nucleotide containing adenine in RNA molecule ?

ⓐ Number of carbon atoms. ⓑ Number of hydrogen atoms.

ⓒ Number of oxygen atoms. ⓓ Number of phosphate groups.

3 Which of the following represents the correct arrangement for the appearance of the genetic traits ?

ⓐ DNA ⟶ Protein ⟶ RNA ⓑ Protein ⟶ RNA ⟶ DNA

ⓒ DNA ⟶ RNA ⟶ Protein ⓓ RNA ⟶ Protein ⟶ DNA

4 Which of the following determines the sequence of amino acids in proteins that are formed in the human body ?

ⓐ Proteins that are present in food.

ⓑ Amino acids that are absorbed in small intestine.

ⓒ Enzymes and body hormones.

ⓓ Genetic information in DNA molecules.

5 If you know that Corona virus (COVID-19) whose genetic material is the nucleic acid (RNA), in the light of this, answer :

(1) What is the chemical formula of the sugar that is present in the nucleotide of the genetic material of this virus ?

ⓐ $C_5H_{10}O_5$ ⓑ $C_5H_{10}O_4$ ⓒ $C_6H_{12}O_6$ ⓓ $C_6H_{11}O_5$

(2) Which of the following contains nitrogen element in the components of genetic material of this virus ?

ⓐ Ribose. ⓑ Deoxyribose. ⓒ Uracil. ⓓ Thymine.

Answer the following question :

6 **What happens in case of :** the absence of the enzymes required to transcribe RNA from DNA ?

Test on Chapter 2 

Chemical Structure of Living Organisms' Bodies (Proteins and Nucleic acids)

First Choose the correct answer (1 : 14)

1 Which of the following milk components work(s) on improving the overall growth of the child ?

ⓐ Lactose. ⓑ Calcium. ⓒ Casein. ⓓ Fats.

2 Which of the following is applied to the amino acids and fatty acids respectively ?

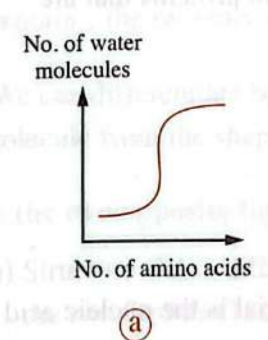
ⓐ The structural unit of protein / The structural unit of lipid.

ⓑ Biological macro-molecules / Monomers.

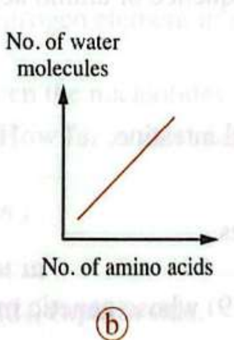
ⓒ Hydroxyl group enters in their structure / Amino group enters in their structure.

ⓓ Nitrogen enters in their structure / Phosphate enters in their structure.

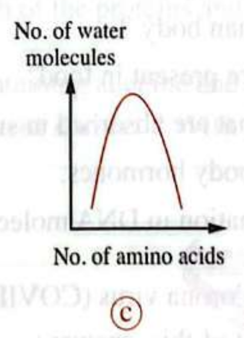
3 Which of the following graphs illustrates the relation between the number of amino acids in a polypeptide chain and the number of water molecules that are resulted on the formation of the chain ?



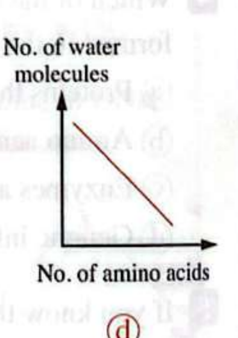
ⓐ



ⓑ



ⓒ



ⓓ

▶ The opposite figure represents a polypeptide chain, study it, then answer :

A, L, H, M, B, K, G, C, H, G, D, C, E, B, F

4 What is the number of amino acids' types in this chain ?

ⓐ 9 ⓑ 11

ⓒ 13 ⓓ 15

5 What are the types of bonds that form this chain ?

ⓐ Covalent and ionic bonds. ⓑ Sulphide and peptide bonds.

ⓒ Peptide and ionic bonds. ⓓ Peptide bonds only.

6 Which of the following represents the similarity between DNA nucleotide and RNA nucleotide ?

ⓐ Thymine base enters in the structure of each of them.
ⓑ Uracil base enters in the structure of each of them.
ⓒ Phosphate group enters in the structure of each of them.
ⓓ Ribose sugar enters in the structure of each of them.

7 Which of the following **doesn't** contain phosphorus element among its components ?

ⓐ ATP ⓑ Thyroxine. ⓒ Casein. ⓓ Nucleotide.

8 From the opposite figure that illustrates a nucleic acid that is found in the living cell, what does this figure consist of ?

ⓐ Three similar building units in the chemical structure.
ⓑ Three different building units in the chemical structure.
ⓒ Four similar building units in the chemical structure.
ⓓ Four different building units in the chemical structure.

9 Which of the following **doesn't** contain nitrogen element in its structure ?

ⓐ The building unit of deoxyribonucleic acid.
ⓑ The building unit of ribonucleic acid.
ⓒ The building unit of albumin.
ⓓ The building unit of starch.

10 Which of the following statements is correct ?

ⓐ In the cell, DNA consists of protein.
ⓑ Protein consists of DNA and is stored in the cell.
ⓒ DNA controls the formation of protein in the cell.
ⓓ The cell consists of DNA and protein.

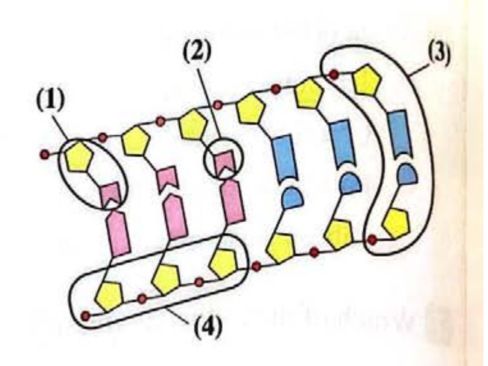
11 Why do scientists believe that the mitochondrion resembles the independent cell ?

ⓐ Because it contains DNA only. ⓑ Because it contains RNA only.
ⓒ Because it contains DNA and RNA ⓓ Because it contains proteins.

12 Which of the following is considered a similarity between haemoglobin and thyroxine ?

ⓐ The type of chemical bonds among the building units.
ⓑ The number of amino acids in the chain.
ⓒ The type of amino acids in the chain.
ⓓ The order of amino acids in the chain.

13 The following figure illustrates a diagrammatic part of DNA structure, which of the following contain phosphate group ?



ⓐ (1) and (2).

ⓑ (1) and (4).

ⓒ (3) and (4).

ⓓ (2) and (4).

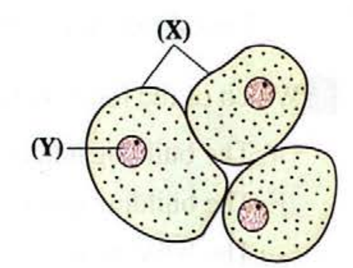
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14 What is the number of water molecules that had been removed from 66 amino acids to form a polypeptide chain ?

ⓐ 1 ⓑ 33 ⓒ 65 ⓓ 66

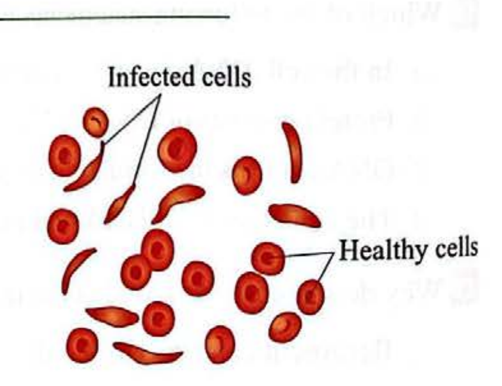
Second Answer the following questions (15 , 16)

15 **The opposite figure** illustrates a group of animal cells. **In the light of your study, determine** which biological macro-molecule enters in the structure of (X) and (Y).



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16 **The opposite figure illustrates the red blood cells of an infected person with sickle cell anemia that is from the genetic diseases resulted from the occurrence of a disturbance in the gene that is responsible for forming the protein of red blood cells.**



Determine each of the following :

(a) What is the protein name in which the disturbance occurred ?

(b) The elements that enter in the structure of protein in which the disturbance occurred.

Why do you think,
not all keys can open the same lock ?

Chapter 3

Chemical Reactions in Living Organisms' Bodies

Metabolism



Metabolism

It is a group of continuous biochemical reactions that take place inside the living organism cells, and its stop leads to the death of the living organism.

- **Metabolic processes are divided into :**

Catabolism	Anabolism
A process of breaking the chemical bonds among the atoms of molecules to extract the chemical energy that is stored in them.	A process of using the simple molecules to build up more complex substances through a chain of reactions that consume energy.
Examples	
Releasing the energy that results from the glucose oxidation (during cellular respiration process).	Synthesis of proteins from the amino acids. Photosynthesis process.

Macro-molecules (A, B, C) → Catabolism → Energy / Micro-molecules → Anabolism → Macro-molecules (D, E, F)

Diagram illustrates metabolism (anabolism and catabolism)

Importance of metabolism

1. Obtaining energy required for performing the vital activities of the cell (catabolism).
2. Growth of the body and repairing the damaged tissues (anabolism).

1 Test yourself



1 Choose the correct answer :

Which of the following is applied to anabolic and catabolic processes respectively ?

ⓐ Oxidation / Polymerization.

ⓑ Producing energy / Consuming energy.

ⓒ Polymerization / Oxidation.

ⓓ Breaking down of chemical bonds / Formation of chemical bonds.

2 What happens if : catabolism process stops in the living organism cells ?

....

....

Enzymes

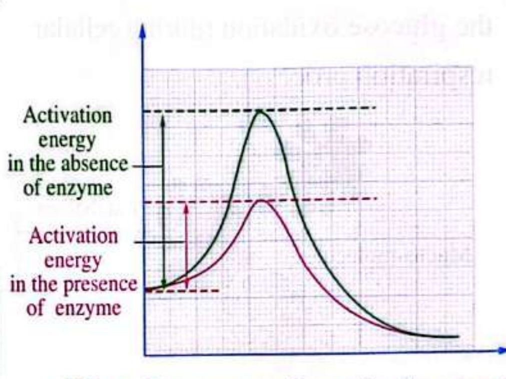
- In order for the biochemical reactions to occur in the cell, they need a high **activation energy** to be started, where the activation energy is the minimum energy needed to start the chemical reaction and to reduce the cell consumption of more energy, there should be a **catalyst (enzyme)** to insure the occurrence of the chemical reaction rapidly.

Enzymes

They are the biological catalysts that consist of protein molecules which work on increasing the speed of the chemical reactions inside the cell.

- The opposite graph illustrates the consumption of a biochemical reaction (metabolic processes) to the energy, where :

Activation energy in the presence of enzyme is less than **Activation energy in the absence of enzyme**



Effect of enzymes on the activation energy needed to start the chemical reaction

Structure of the enzyme

- The enzyme is made up of the combination of a large number of amino acids that form a chain or more of polypeptide which forms the specific spatial structure of enzyme.

Properties of the enzymes

1. Enzymes are similar to the other chemical catalysts, **because** they participate in the chemical reactions inside the cell to speed them up without being affected or consumed.
2. Enzymes are **highly specific** than other chemical catalysts, as each enzyme is specific for :
   - One reactant substance called **substrate (S)**.
   - One type or a few types of reactions.
3. Enzymes reduce the activation energy needed to start the reaction.
4. Enzymes are affected in their action by the hydrogen ion concentration (pH) and temperature.

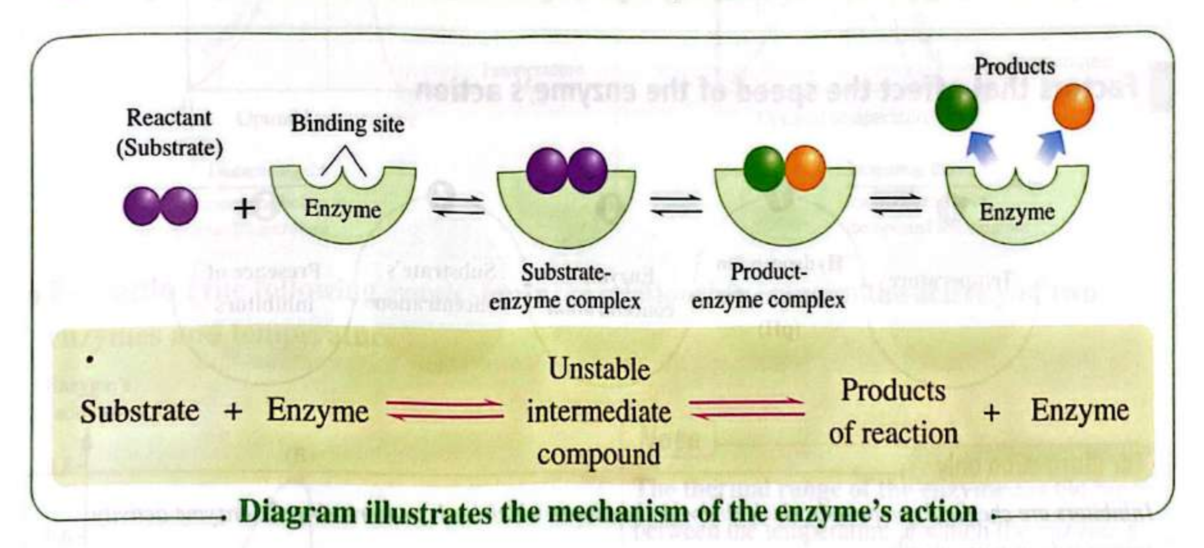
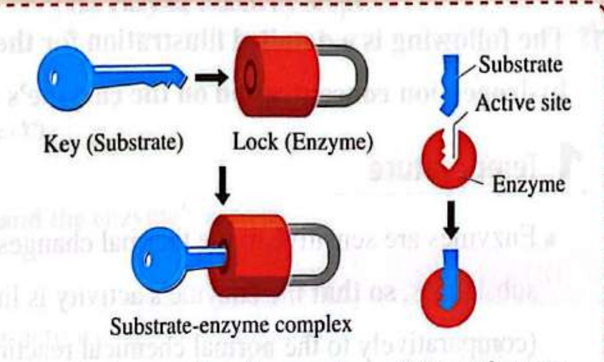


Diagram illustrates the mechanism of the enzyme's action

Key Points

- The action mechanism of enzymes based on the lock-key theory, where the substrate shape fits exactly the enzyme through what is known as "the active site".

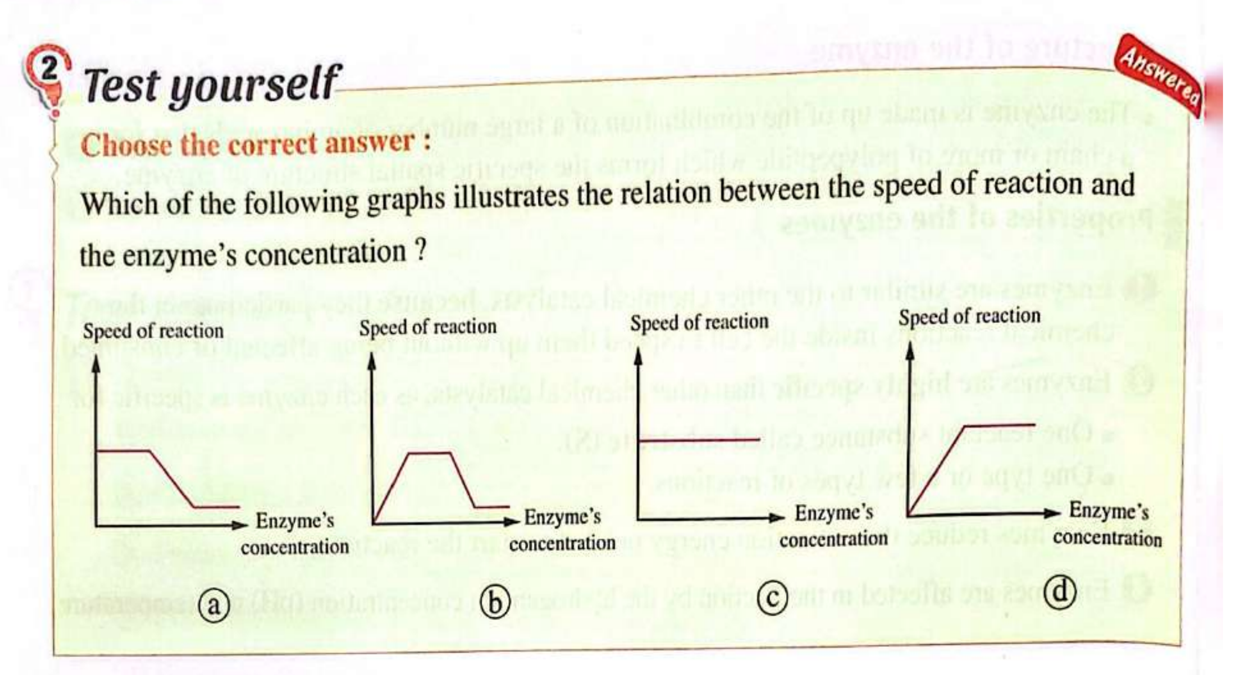


- The speed of the enzymatic reaction increases by increasing the number of the substrate molecules bound with the enzyme molecules till reaching the saturation state, at which all the substrate molecules are bound with the enzyme molecules, therefore the stability of the enzyme activity takes place.

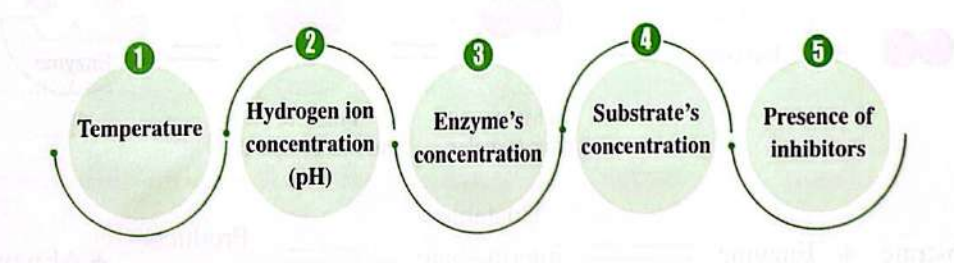
Test yourself

Choose the correct answer :

Which of the following graphs illustrates the relation between the speed of reaction and the enzyme's concentration ?



Factors that affect the speed of the enzyme's action



For illustration only

***Inhibitors** are chemical compounds which bind with the enzyme which leads to decreasing the enzyme activity temporarily or permanently.*

☆ **The following is a detailed illustration for the effect of each of the temperature and hydrogen ion concentration on the enzyme's action :**

1 Temperature

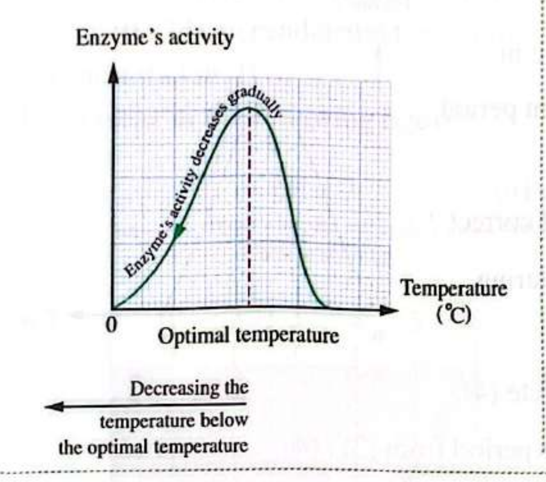
- Enzymes are sensitive to the thermal changes, because they are made up of protein substances, **so that** the enzyme's activity is limited in a narrow range of temperatures (comparatively to the normal chemical reactions).

  As :

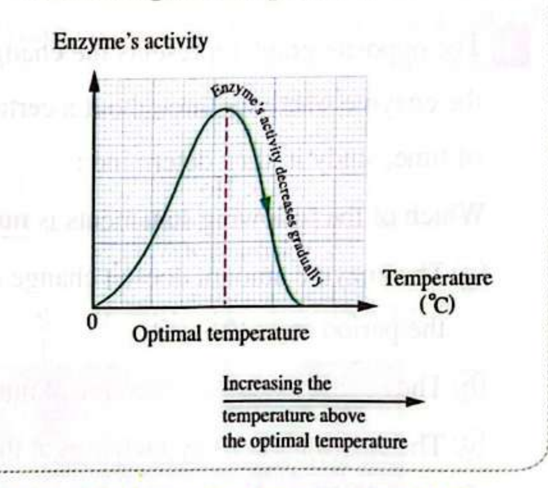
  - Each enzyme has a certain temperature at which the enzyme is more active and called the "**optimal temperature**".

- The enzyme's activity decreases gradually, when :

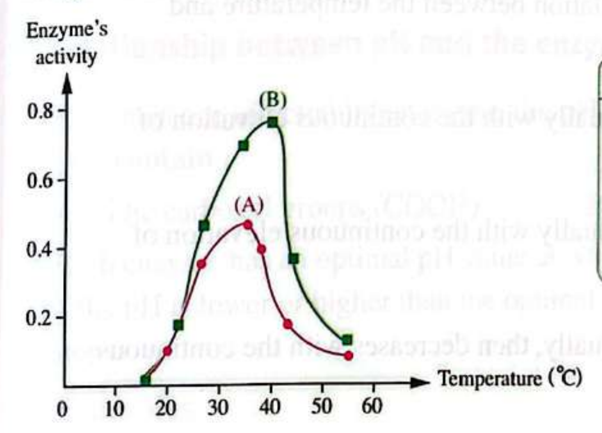
- The temperature **decreases** below the optimal temperature, until it reaches a **minimum temperature** at which the enzyme's activity is the lowest and it stops completely at 0°C, **but the enzyme restores its activity (gets reactivated) once more, on rising the temperature.**



- The temperature **rises** above its optimal temperature, **until it reaches a certain temperature at which the enzyme's activity stops completely, due to the change of its natural composition (denaturation) and the enzyme will not restore its activity, even after decreasing the temperature.**



- **Example : the following graph shows the relationship between the activity of two enzymes and temperature :**



Note

The thermal range of the enzyme : is the range between the temperature at which the enzyme's activity starts and the temperature at which the enzyme's activity stops.

The relationship between the temperature and the enzyme's activity

	Enzyme (A)	Enzyme (B)
Temperature at which the enzyme starts its activity (minimal temperature).	16°C	16°C
Temperature at which the maximum enzyme activity (optimal temperature) appears.	35°C	40°C
Temperature at which the enzyme's activity stops.	55°C	55°C
The thermal range of the enzyme's activity.	16°C : 55°C	

Life application :

Suitable temperatures are recorded on some clothes detergents to use them properly, **in order to** provide the optimal temperature at which the enzymes are present in these detergents work with their maximum activity.

3 Test yourself

Answered

Choose the correct answer :

1 The opposite graph represents the change in the enzyme's activity throughout a certain period of time, study it, then determine :

Which of the following statements is **not** correct ?

ⓐ The enzyme amount doesn't change during the period from (0) : (4).

ⓑ The reaction products increase at minute (4).

ⓒ The enzyme's activity increases at the period from (2) : (4).

ⓓ The highest concentration of reactants is at the time (0).

2 Which of the following illustrates the relation between the temperature and the enzyme's activity ?

ⓐ The enzyme's activity increases gradually with the continuous elevation of temperature.

ⓑ The enzyme's activity decreases gradually with the continuous elevation of temperature.

ⓒ The enzyme's activity increases gradually, then decreases with the continuous elevation of temperature.

ⓓ The enzyme's activity decreases gradually, then increases with the continuous elevation of temperature.

2 Power of hydrogen (Hydrogen ion concentration) "pH"

- **Power "Potential" of hydrogen (pH) :** it is a measurement that determines the concentration of hydrogen ions (H^+) in the solution, in order to determine whether the solution is acidic, alkaline (basic) or neutral.

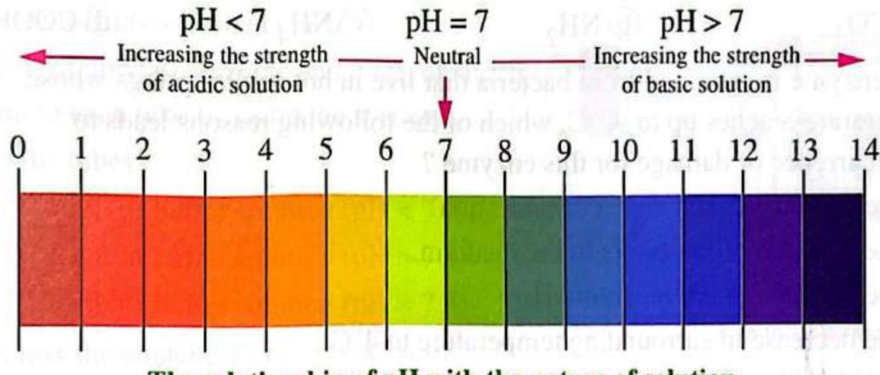
- **Solutions can be classified according to the hydrogen power (pH), as follows :**

Solutions

- **Acidic solutions**: The hydrogen power is less than 7 (pH < 7).
- **Neutral solutions**: The hydrogen power is equal to 7 (pH = 7).
- **Alkaline solutions**: The hydrogen power is greater than 7 (pH > 7).

- The values of power of hydrogen of solutions range between (0 : 14), depending on the positive hydrogen ion concentration (H^+).
This is clear in the following figure :

> **Note**
> The neutral hydrogen power (pH = 7) equals the pH value of pure water at temperature (25°C).



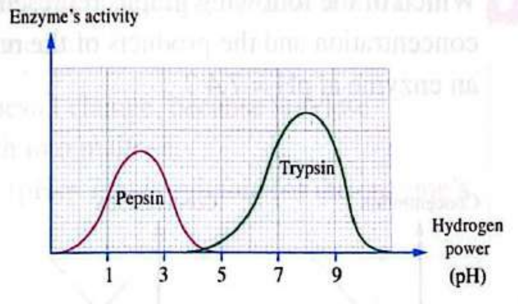
The relationship of pH with the nature of solution

Relationship between pH and the enzyme's activity

- **Enzymes are affected by changing the pH values, because they are protein substances that contain :**
  - Acidic carboxyl groups (COOH). - Basic amino groups (NH_2).
- Each enzyme has an optimal pH value at which it works with a maximum efficiency, and if the pH is lower or higher than the optimal value, the enzyme's activity decreases until it stops.

- **Examples :**

1. Pepsin enzyme works in the stomach at acidic pH value ranging from (1.5 : 2.5).
2. Trypsin enzyme works in the small intestine at basic pH value ranging from (7.5 : 8).



The optimal pH values for pepsin and trypsin enzymes

3. Most enzymes work at pH value equals 7.4, as the amino acids molecules that form the enzyme contain acidic carboxyl groups (COOH) and basic amino groups (NH_2).



Key Points

Factors which increase the speed of the enzymatic reaction are :

(1) The increase of enzyme concentration to a certain limit.

(2) The increase of substrate concentration to a certain limit.

(3) The optimal temperature for enzyme action.

(4) The optimal pH value for enzyme action. **(5)** The absence of inhibitors.



Test yourself



Choose the correct answer :

1 Which of the following functional groups has a role in increasing the pH value of the solution ?

ⓐ HCO_3 ⓑ NH_2 ⓒ NH_4 ⓓ COOH

2 If an enzyme is extracted from bacteria that live in hot acidic springs whose temperature reaches up to 90°C, which of the following reasons leads to the occurrence of damage for this enzyme ?

ⓐ The increase of substrate concentration.

ⓑ The addition of inhibitors to the medium.

ⓒ The increase in the medium pH

ⓓ The decrease in surrounding temperature to 4°C

3 Although the enzymes that are present in the human stomach are transferred with food to the small intestine, they have no action inside the small intestine, what is the reason for that ?

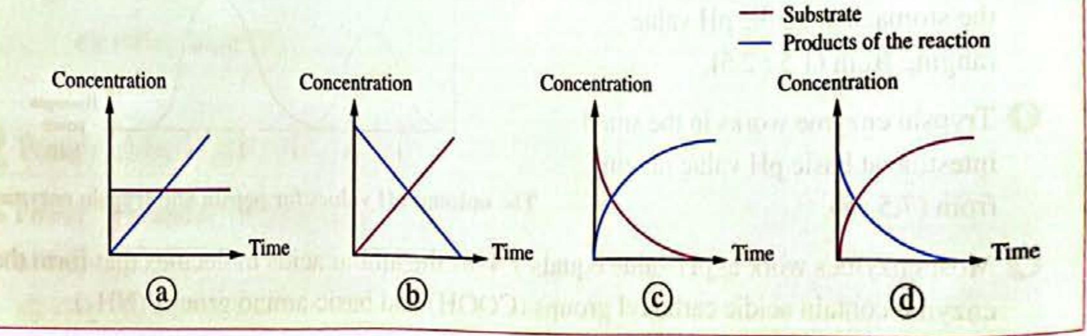
ⓐ The shortage in the energy required for the enzymes' action inside the cavity of small intestine.

ⓑ The difference in temperature between the small intestine and stomach.

ⓒ The difference of pH value between the small intestine and stomach.

ⓓ The shortage of food concentration in the small intestine than the stomach.

4 Which of the following graphs represents the relation between the substrate's concentration and the products of the reaction (during period of time) when using an enzyme at pH = 7.4 ?





Practical Activity 5 Effect of pH on the enzyme's activity

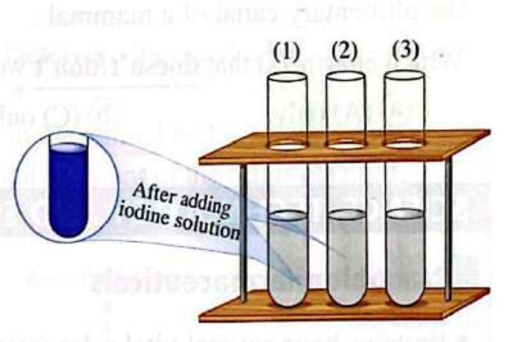


1. Used materials and tools :

- Salivary amylase enzyme (5%).
- Starch solution (5%).
- Buffer solutions of different pH values.
- Iodine solution.
- Syringes (5 mL).
- 3 test tubes.
- Test tubes rack.
- Sticky papers.
- Pippete.
- Stopwatch.
- Marker.

> **Note**
> **Buffer solution :** is a solution that keeps the solution's pH value constant at a certain value.

2. Procedure :



1. Numerate the tubes from (1) : (3).
2. Put 2 mL of amylase enzyme and 2 mL of starch solution in each tube by using the syringes.
3. Add to the tubes :
   - No. (1) 1 mL of buffer solution (pH < 7.5).
   - No. (2) 1 mL of buffer solution (pH > 7.5).
   - No. (3) 1 mL of buffer solution (pH = 7.5).
   - Then mix the contents of each tube well.
4. Add equal drops of iodine solution to each tube.
5. Leave the tubes for a period of time and record your observations.

> **Note**
> The third tube represents the control experiment.

3. Observations and explanation :

Tube no.	Observations	Explanations
(1) & (2)	Iodine solution colour changes into dark blue.	Iodine colour changes, because amylase doesn't hydrolyze starch into maltose. **i.e.** The values of (pH < 7.5) and (pH > 7.5) are not suitable for the enzyme's activity, because it works in a weak alkaline medium.
(3)	Iodine solution colour doesn't change.	Iodine colour doesn't change, because amylase hydrolyzes starch into maltose. **i.e.** The value of (pH = 7.5) is suitable for the enzyme's activity.

4. Conclusion :

The enzyme's activity differs by changing the pH value, where the enzyme's activity decreases, when the pH is higher or lower than the optimal pH value at which the enzyme works efficiently.

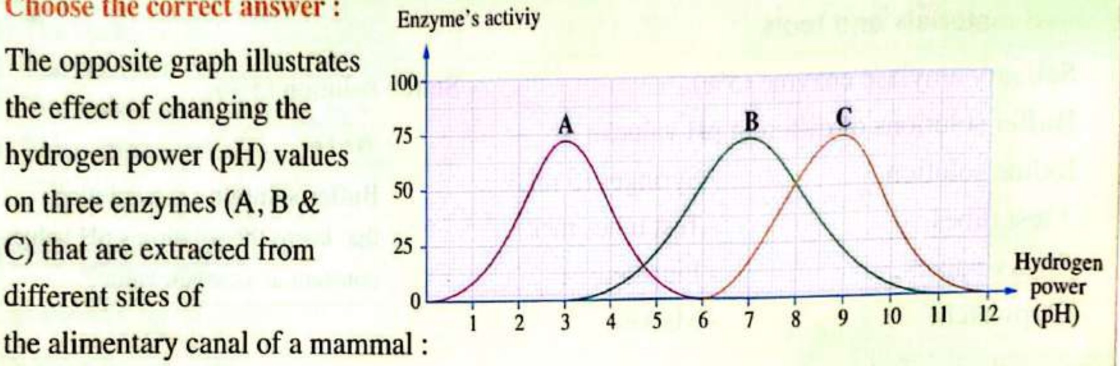


5 Test yourself

Answered

Choose the correct answer :

The opposite graph illustrates the effect of changing the hydrogen power (pH) values on three enzymes (A, B & C) that are extracted from different sites of the alimentary canal of a mammal :



Which enzyme(s) that **doesn't/don't** work in the neutral medium ?

ⓐ (A) only. ⓑ (C) only. ⓒ (A) and (C). ⓓ (A) and (B).

SCIENCE, TECHNOLOGY AND SOCIETY

Enrichment information

Nanobiopharmaceuticals

- Proteins have several vital roles inside the human body, where it has been discovered that they are able to treat a lot of diseases and disorders inside the body. So, these biological macro-molecules (proteins) could be produced and used in treating some diseases, and these medicines are known as "**biopharmaceuticals**".
- **Disadvantages of biopharmaceuticals :**
  It is difficult to deliver these medicines directly to the target parts or cells in the body like several medicines.
- **The way to avoid the disadvantages of biopharmaceuticals :**
  After the enormous development resulted from the nanotechnology, many trials are carried out to deliver these biopharmaceuticals to the infected cells in the body by using nanoparticles "nanoparasites", leading to the arising of a new field called "nanobiopharmaceutics" and the products used in this field are called "nanobiopharmaceuticals".

Questions on Chapter 3

Chemical Reactions in Living Organisms' Bodies



The questions signed by ✱ are answered in detail. | ● Understand ● Apply ● Analyze



First Multiple Choice Questions

1 Which of the following is from the forms of the anabolic process inside the living organism ?

ⓐ Oxidation. ⓑ Decomposition. ⓒ Polymerization. ⓓ Digestion.

---

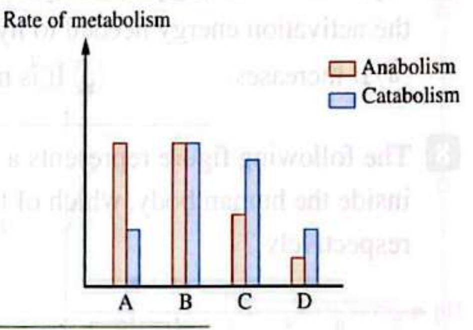
2 Which of the following statements expresses a characteristic for the catabolic process ?

ⓐ It aims to store energy inside the cell, till using it.
ⓑ It occurs in the plant cells, and it doesn't occur in the animal cells.
ⓒ By which the energy required for performing the vital functions of the cell is obtained.
ⓓ It occurs in animal cells, but doesn't occur in plant cells.

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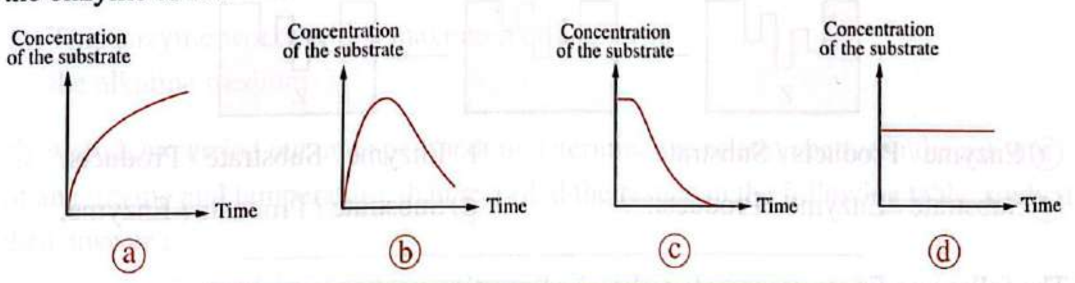
3 From the opposite graph, which of the following shows the rate of catabolism and anabolism for the cells of a 5 month-old child ?

ⓐ A ⓑ B
ⓒ C ⓓ D



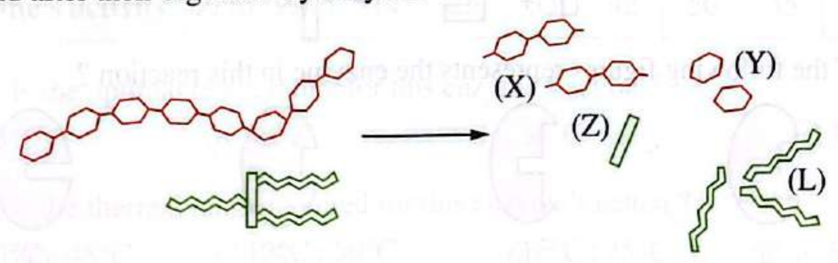
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4 ✱ Which of the following graphs shows the concentration of the substrate on adding the enzyme to it ?



---

5 The following figure illustrates the molecules of two different food substances before and after their digestion by enzymes :



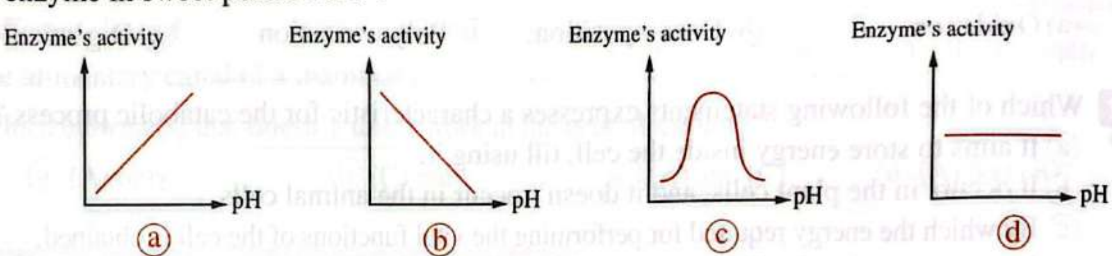
(1) Which of the following represents the digestion products of a piece of bread in mouth ?

ⓐ (X). ⓑ (Y). ⓒ (Z). ⓓ (L).

(2) Which of the following represents the final product of starch digestion ?

ⓐ (X). ⓑ (Y). ⓒ (Z). ⓓ (L).

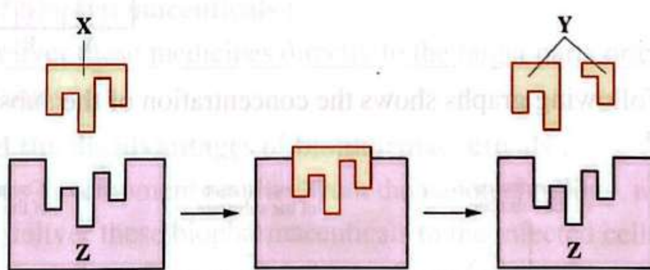
6 ✳ Which of the following graphs represents the effect of pH on the action of catalase enzyme in sweet potato cells ?



7 If you know that amylase enzyme helps in starch digestion in mouth, how is the activation energy needed to hydrolyze starch on adding the enzyme affected ?

ⓐ It increases. ⓑ It is not affected. ⓒ It decreases. ⓓ It vanishes.

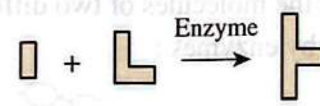
8 The following figure represents a model for the mechanism of an enzyme action inside the human body, which of the following represents the letters (X), (Y) and (Z) respectively ?



ⓐ Enzyme / Products / Substrate. ⓑ Enzyme / Substrate / Products.

ⓒ Substrate / Enzyme / Products. ⓓ Substrate / Products / Enzyme.

9 The following figure represents a chemical reaction :



Which of the following figures represents the enzyme in this reaction ?


ⓐ


ⓑ


ⓒ


ⓓ

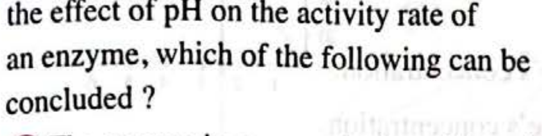


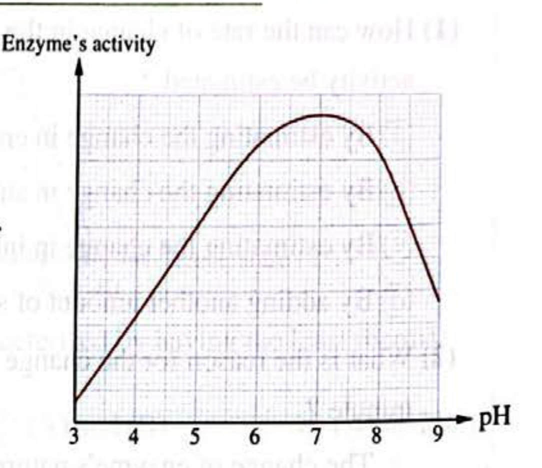
10 If the thermal range for an enzyme's activity is (10°C : 40°C), at which of the following temperatures is probable that the maximum activity of this enzyme is ?

ⓐ 10 °C ⓑ 30 °C ⓒ 40 °C ⓓ 50 °C

---

11 From the opposite graph that illustrates the effect of pH on the activity rate of an enzyme, which of the following can be concluded ?





ⓐ The enzyme is consumed when pH reaches (9).

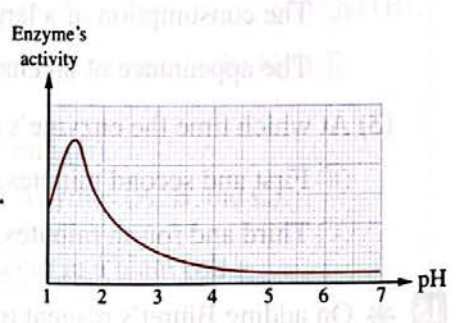
ⓑ The enzyme works with the highest efficiency at pH = 6

ⓒ The rate of the enzyme's activity decreases to half, when pH changes from (5) : (7).

ⓓ The rate of the enzyme's activity is equal at pH values (5) and (8.5).

---

12 The opposite graph shows the relation between the hydrogen power (pH) and the activity of an enzyme, which of the following statements could be concluded ?



ⓐ This enzyme is not affected by the medium's type.

ⓑ This enzyme works with a maximum efficiency in the acidic medium.

ⓒ This enzyme works with a maximum efficiency in the neutral medium.

ⓓ This enzyme works with a maximum efficiency in the alkaline medium.

---

13 ✱ A student carried out an experiment to determine the relation between the activity of an enzyme and temperature, then recorded the results in the following table, study it, then answer :

Temperature °C	5	10	15	20	25	30	35	40	45	50
Enzyme's activity	Zero	Zero	14	25	33	42	50	35	11	Zero

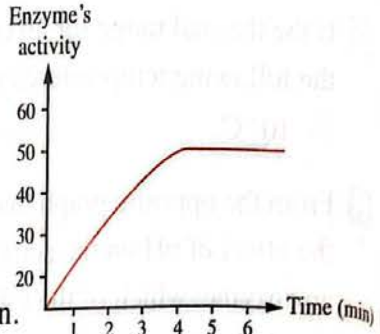
(1) What is the optimal temperature for this enzyme's action ?

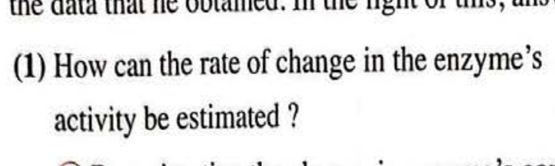
ⓐ 45°C ⓑ 40°C ⓒ 35°C ⓓ 30°C

(2) What is the thermal range required for this enzyme's action ?

ⓐ 10°C : 45°C ⓑ 10°C : 50°C ⓒ 15°C : 45°C ⓓ 5°C : 50°C

14 A researcher studied the activity of an enzyme with respect to time, and the opposite graph represents the data that he obtained. In the light of this, answer :





(1) How can the rate of change in the enzyme's activity be estimated ?

ⓐ By estimating the change in enzyme's concentration.

ⓑ By estimating the change in substrate's concentration.

ⓒ By estimating the change in inhibitors' concentration.

ⓓ By adding another amount of substrate.

(2) What is the reason for the change in the curve between the third minute and fifth minute ?

ⓐ The change of enzyme's nature.

ⓑ The arrival of enzyme to its maximum speed.

ⓒ The consumption of a large amount of substrate.

ⓓ The appearance of an enzyme's inhibitor.

(3) At which time the enzyme's activity is the least ?

ⓐ First and second minutes. ⓑ Second and third minutes.

ⓒ Third and fourth minutes. ⓓ Fourth and fifth minutes.

---

15 * On adding Biuret's reagent to a sample of substance (X), the colour of the indicator turns violet colour, after that the substance (Y) is added to another sample of substance (X) with drops of hydrochloric acid. After half an hour, Biuret's reagent is added to this sample and the colour of the reagent is not changed. From your study, determine from the following table, what do the substances (X) and (Y) represent ?

	Substance (X)	Substance (Y)
ⓐ	Egg	Trypsin
ⓑ	A piece of meat	Pepsin
ⓒ	Milk	Trypsin
ⓓ	Corn oil	Pepsin

---

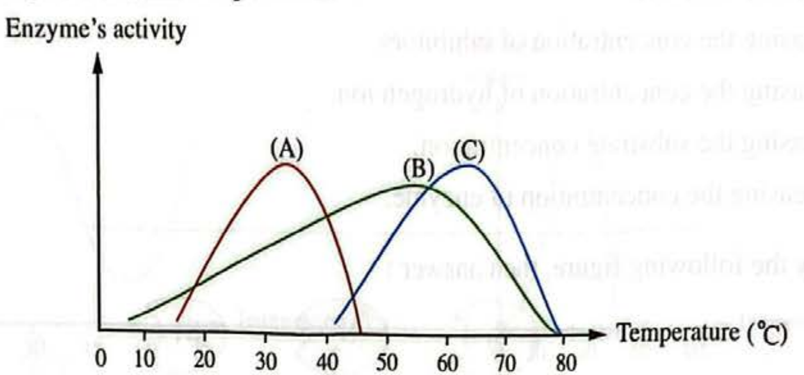
16 Which of the following statements is **not** correct ?

ⓐ All proteins are enzymes. ⓑ All enzymes contain peptide bonds.

ⓒ All enzymes are proteins. ⓓ All proteins contain nitrogen element.



17 * From the following graph which represents the activity of three different enzymes (A, B and C) at different temperatures :



(1) Which of the following enzymes is(are) characterized by having the least thermal range ?

ⓐ (A) only. ⓑ (B) only. ⓒ (A) and (B). ⓓ (A) and (C).

(2) Which of the following enzyme(s) is(are) characterized by having the largest thermal range ?

ⓐ (C) only. ⓑ (B) only. ⓒ (B) and (C). ⓓ (A) and (B).

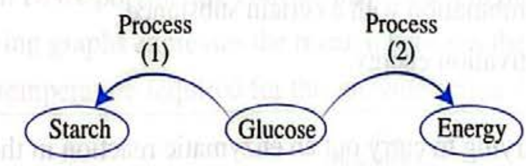
(3) Which of the following enzymes have the highest ability to sustain the high temperatures ?

ⓐ (B) and (C). ⓑ (A) and (B).

ⓒ (A) and (C). ⓓ All enzymes (A, B and C).

---

18 The following diagram expresses two processes that occur in a plant cell :



What do these processes represent ?

ⓐ The process no. (2) is catabolism, and the process no. (1) is anabolism.

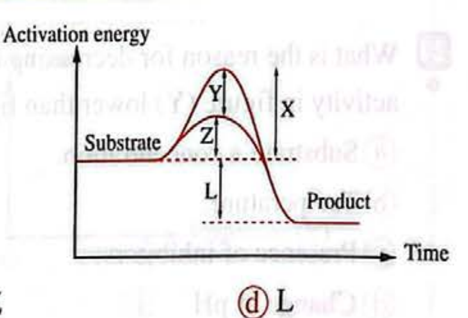
ⓑ The process no. (1) is catabolism, and the process no. (2) is anabolism.

ⓒ Both processes no. (1) and (2) are catabolism.

ⓓ Both processes no. (1) and (2) are anabolism.

---

19 The opposite graph shows the effect of the enzyme on the activation energy of a chemical reaction. Which of the following represents the arrow that illustrates the reduction in the activation energy, due to the addition of an enzyme ?



ⓐ X ⓑ Y ⓒ Z ⓓ L

20 In the enzymatic reaction in stomach, in which of the following cases the product's concentration increases ?

ⓐ Increasing the concentration of inhibitors.

ⓑ Increasing the concentration of hydrogen ion.

ⓒ Increasing the substrate concentration.

ⓓ Decreasing the concentration of enzyme.

21 ✱ Study the following figure, then answer :

Substrate S_1 S_2 S_3

Enzyme E_1 E_2 E_3

Which of the following statements is correct about the enzymes that are present in the figure ?

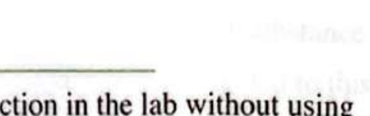
ⓐ E_1 is less specific than E_3

ⓑ E_1 is more specific than E_3

ⓒ E_2 is less specific than E_3

ⓓ All these enzymes are highly specific.

22 The opposite figure represents one of the enzyme's characteristics, what is this ?



ⓐ Participating in the reactions without consuming.

ⓑ Increasing the reaction speed.

ⓒ Specializing in combination with a certain substance.

ⓓ Decreasing the activation energy.

23 What happens when trying to carry out an enzymatic reaction in the lab without using the enzyme required for the reaction to occur inside the living organism body ?

ⓐ It doesn't occur, due to the absence of enzyme.

ⓑ It occurs and gives different results.

ⓒ It occurs under certain conditions.

ⓓ It occurs in a faster rate.

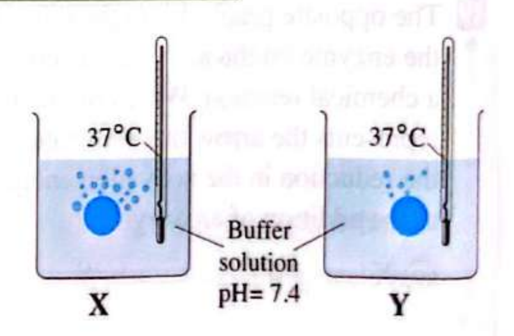
24 What is the reason for decreasing the enzyme's activity in figure (Y) lower than figure (X) ?

ⓐ Substrate's concentration.

ⓑ Temperature.

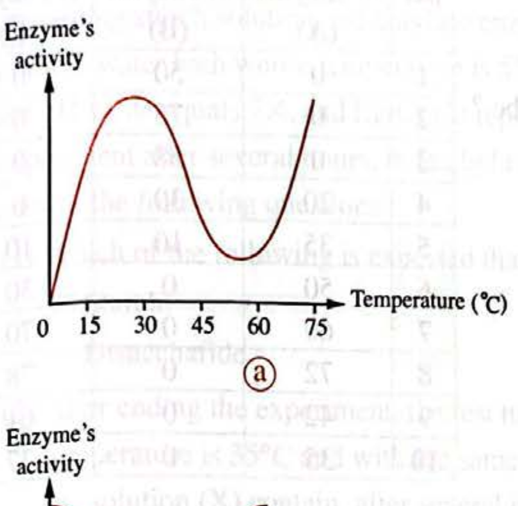
ⓒ Presence of inhibitors.

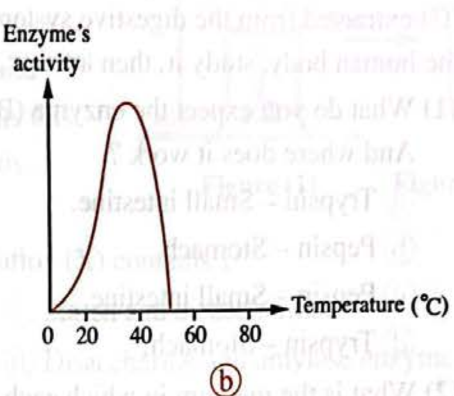
ⓓ Change of pH

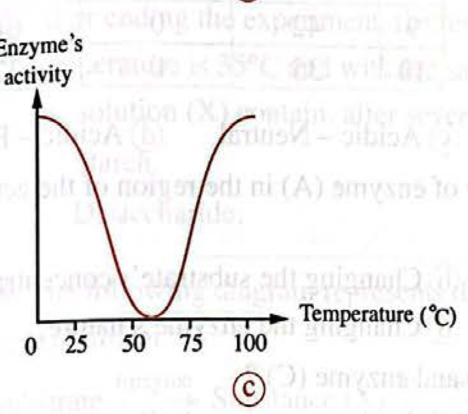


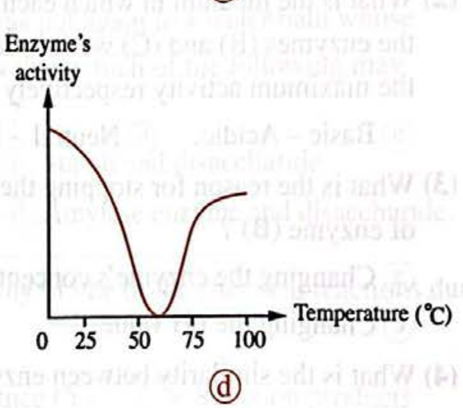


25 Which of the following graphs illustrates the correct relation between the temperature and the activity of an enzyme ?

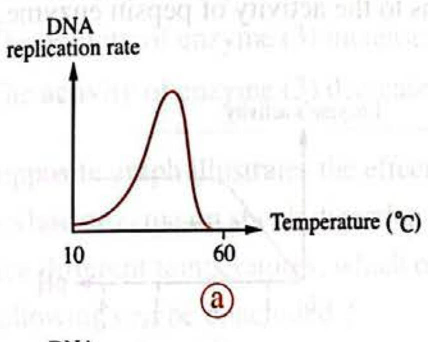


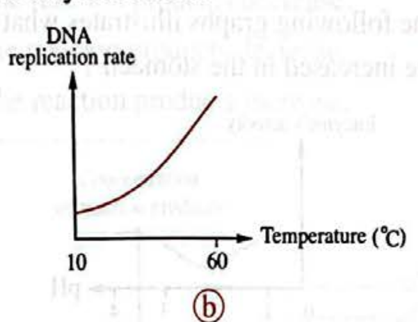


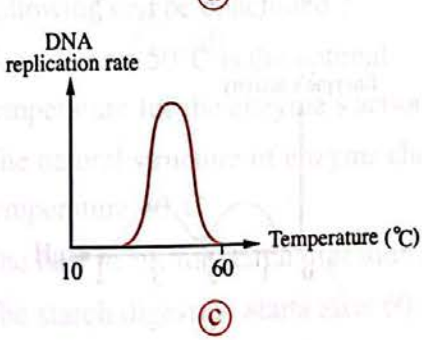


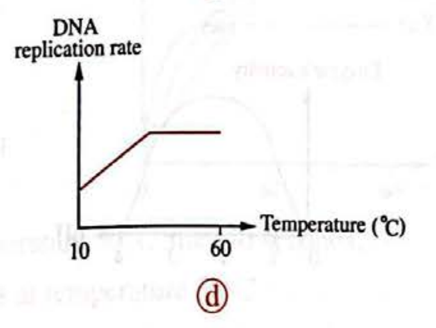


26 ✻ Some types of bacteria live in hot springs whose temperature ranges between 85°C to 95°C, and contain DNA-polymerase enzyme that is used in the replication of DNA, which of the following graphs expresses the relation between the rate of bacterial DNA replication and the temperature required for this enzyme action ?









27 The opposite table shows the enzyme's activity for the action of three enzymes (A), (B) and (C) extracted from the digestive system of the human body, study it, then answer :

pH	Activity of enzyme (A)	Activity of enzyme (B)	Activity of enzyme (C)
1	0	50	0
2	0	75	0
3	0	58	0
4	20	30	0
5	35	10	10
6	50	0	30
7	60	0	70
8	72	0	78
9	42	0	61
10	35	0	37

(1) What do you expect the enzyme (B) to be ? And where does it work ?

ⓐ Trypsin – Small intestine.
ⓑ Pepsin – Stomach.
ⓒ Pepsin – Small intestine.
ⓓ Trypsin – Stomach.

(2) What is the medium in which each of the enzymes (B) and (C) works with the maximum activity respectively ?

ⓐ Basic – Acidic. ⓑ Neutral – Basic. ⓒ Acidic – Neutral. ⓓ Acidic – Basic.

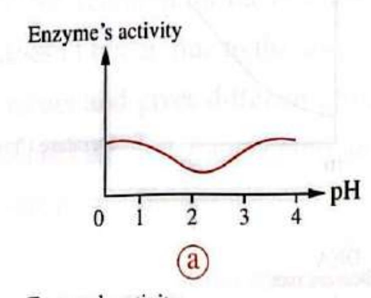
(3) What is the reason for stopping the activity of enzyme (A) in the region of the action of enzyme (B) ?

ⓐ Changing the enzyme's concentration. ⓑ Changing the substrate's concentration.
ⓒ Changing the pH value. ⓓ Changing the enzyme's nature.

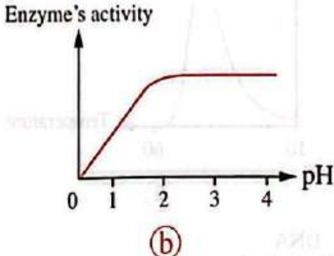
(4) What is the similarity between enzyme (A) and enzyme (C) ?

ⓐ Hydrogen ion concentration that is suitable for the enzyme action.
ⓑ Substrate's concentration.
ⓒ Enzyme's concentration. ⓓ The presence of inhibitors.

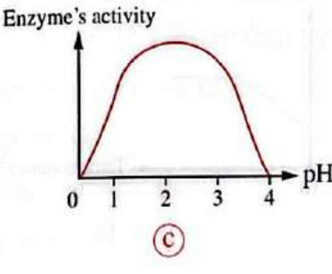
28 If you know that pepsin enzyme helps in the digestion of proteins in stomach. Which of the following graphs illustrates what happens to the activity of pepsin enzyme, if pH value increased in the stomach ?



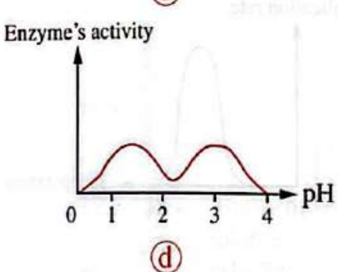
ⓐ



ⓑ



ⓒ



ⓓ



29 * In an experiment, figure (1) represents the beginning of the experiment, where test tube containing starch solution and amylase enzyme was put in a water bath whose temperature is 55°C and the pH value equals 7.4, and figure (2) represents this experiment after several hours, in the light of this, answer the following questions :

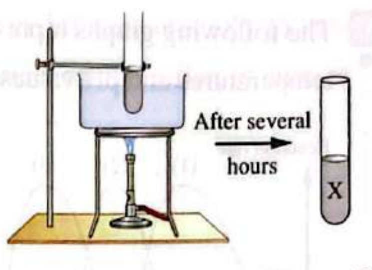


Figure (1) Figure (2)

(1) Which of the following is expected that solution (X) contains ?

ⓐ Starch.
ⓑ Starch and disaccharide.
ⓒ Disaccharide.
ⓓ Disaccharide and amylase enzyme.

(2) After ending the experiment, the test tube was put again in a water bath whose temperature is 35°C and with the same pH value, which of the following may the solution (X) contain, after several hours ?

ⓐ Starch.
ⓑ Starch and disaccharide.
ⓒ Disaccharide.
ⓓ Amylase enzyme and disaccharide.

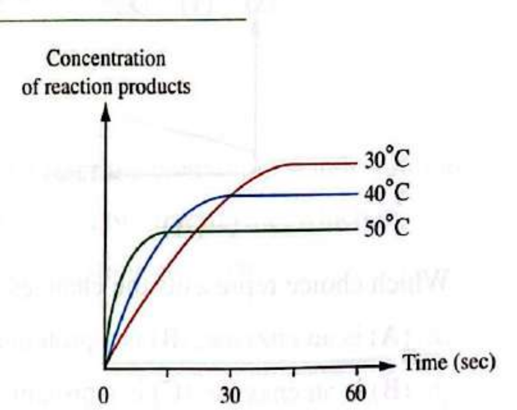
30 * The following diagram represents the pathway of one of the chemical reactions during an experiment :

Substrate $\xrightarrow[(1)]{\text{Enzyme}}$ Substance (X) $\xrightarrow[(2)]{\text{Enzyme}}$ Substance (Y) $\xrightarrow[(3)]{\text{Enzyme}}$ Reaction products

What do you expect to happen on adding an excess amount of substance (Y) to the chemical reaction ?

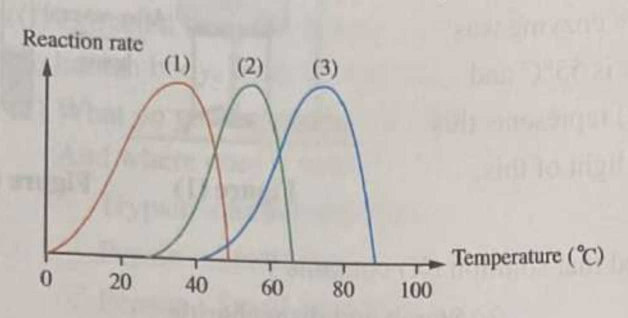
ⓐ The activity of enzyme (3) increases and the reaction products increase.
ⓑ The activity of enzyme (3) decreases and the reaction products decrease.
ⓒ The activity of enzyme (3) increases and the reaction products decrease.
ⓓ The activity of enzyme (3) decreases and the reaction products increase.

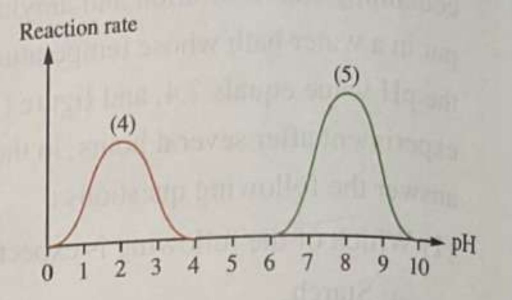
31 The opposite graph illustrates the effect of amylase enzyme on starch digestion at three different temperatures, which of the following can be concluded ?



ⓐ Temperature 50°C is the optimal temperature for the enzyme's action.
ⓑ The natural structure of enzyme changes at temperature 40°C
ⓒ The best result for starch digestion at temperature 30°C after 40 seconds.
ⓓ The starch digestion starts after 60 seconds at temperature 30°C

32 The following graphs represent the reaction rate for various kinds of enzymes at different temperatures and pH values, study them, then answer :





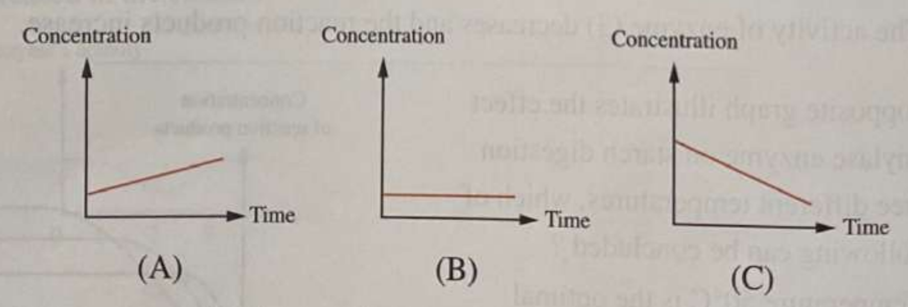
(1) Which of the following curves represent the temperature range and pH value of an enzyme extracted from the human stomach ?

ⓐ Curves (1) & (4).
ⓑ Curves (1) & (5).
ⓒ Curves (2) & (4).
ⓓ Curves (3) & (4).

(2) Which of the following curves represent the temperature range and pH value of an enzyme extracted from bacteria that live in hot springs where their temperature reaches 75°C or more and with an alkaline medium ?

ⓐ Curves (1) & (2).
ⓑ Curves (2) & (5).
ⓒ Curves (3) & (4).
ⓓ Curves (3) & (5).

33 ✳ The following three graphs describe the changes in the concentration of each of the enzyme, protein and amino acids that are produced by the effect of an enzyme which decomposes protein :



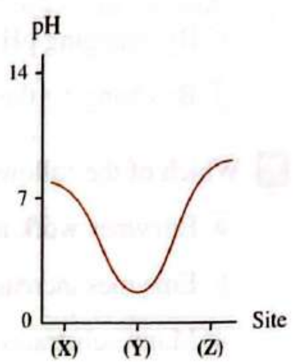
Which choice represents the changes that occur in each graph ?

ⓐ (A) is an enzyme, (B) is a protein and (C) is amino acids.
ⓑ (B) is an enzyme, (C) is a protein and (A) is amino acids.
ⓒ (B) is an enzyme, (A) is a protein and (C) is amino acids.
ⓓ (C) is an enzyme, (B) is a protein and (A) is amino acids.

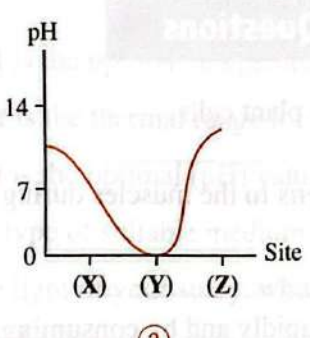


34 ✳ The following table illustrates some enzymes that work in different sites (X), (Y) and (Z), in the digestive system in human and the suitable pH value for the action of each of them :

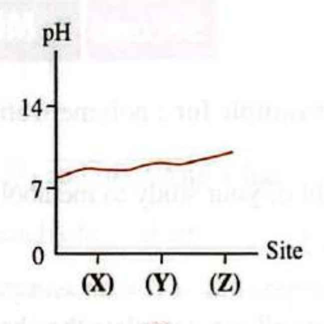
Site of enzyme	Enzyme	pH range
Mouth (X)	Salivary amylase	7.2 : 7.5
Stomach (Y)	Pepsin	1.5 : 2.5
Small intestine (Z)	Pancreatic amylase – Trypsin – Lipase	7.5 : 8



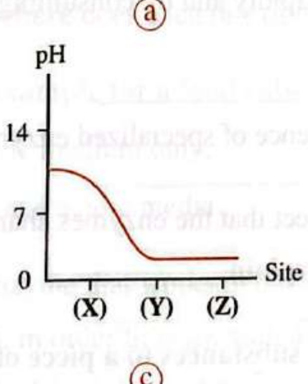
From the previous graph, which graph represents what happens if a disorder occurred in site (Y) leads to stopping its secretions ?



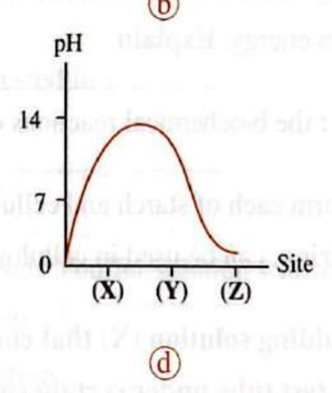
ⓐ



ⓑ



ⓒ



ⓓ

35 A student carried out an experiment, where he put a test tube containing starch solution and amylase enzyme in suitable conditions for the action of this enzyme, which of the following can the student perform to assure the digestion of starch ?

ⓐ Adding Biuret's reagent.

ⓑ Adding diluted HCl acid.

ⓒ Adding iodine solution.

ⓓ Measuring the volume of tube contents before and after the experiment.

36 Fishermen use ice to keep the fish, how does the ice keep the fish fresh ?

ⓐ By stopping the activity of enzymes that lyse the cells.

ⓑ By increasing the activity of metabolic process for cells.

ⓒ By changing pH value of the surrounding medium around fish.

ⓓ By changing the nature of enzymes that lyse the cells.

37 Which of the following characteristics makes the enzymes beneficial in many fields ?

ⓐ Enzymes work in wide range of pH

ⓑ Enzymes increase the speed of certain reactions.

ⓒ Many substrates bind to the active site of enzyme.

ⓓ The nature of enzymes doesn't change easily.

Second Miscellaneous Questions

1 **Give an example for :** polymerization process in the plant cells.

2 In the light of your study to metabolism, **what happens to** the muscles during physical exercises ?

3 The living cell can complete the chemical reactions rapidly and by consuming less activation energy. **Explain**.

4 **Explain :** the biochemical reactions occur in the presence of specialized enzymes only.

5 Plants form each of starch and cellulose, do you expect that the enzymes sharing in starch synthesizing, can be used in cellulose formation ? **Explain.**

6 **When adding solution (X) that consists of several substances to a piece of bread inside a test tube under certain conditions, simple sugars are produced :**

(a) What are the substances that form solution (X) ? **And what** is their importance ?

(b) What are the conditions that are taken during experiment ? **And what happens in case of** the occurrence of a change in these conditions ?

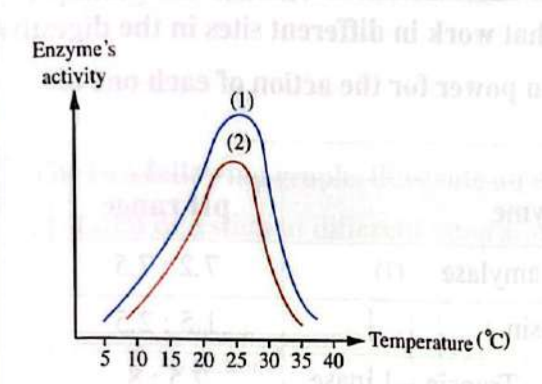
(c) What are the similarities and differences between the catalyst of the previous reaction and the other catalysts ?

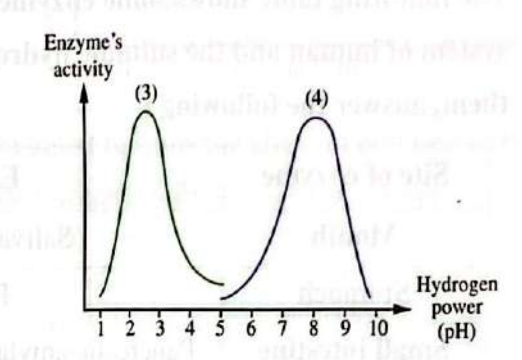
7 **Give reason for :** the suitable temperatures for using some clothes detergents are recorded on them.



8 **What happen in case of :** decreasing the medium temperature at which the amylase enzyme works to 0°C ?

9 **The two following graphs show the relation between some enzymes' activity and each of the temperature and hydrogen power (pH) value :**





(a) **What** is the optimal temperature for enzyme no. (1) ?

(b) **What** is the thermal range for enzyme no. (2) ?

(c) **What** is the optimal (pH) value for enzyme no. (3) and (4) ? **And what** is the type of suitable medium for the action of each one of them ?

(d) In the light of your study, **what** does each of enzymes no. (3) and (4) represent ? **And where** does each one of them work ?

10 **Give an example for a food substance that is digested in :**

(a) Alkaline medium only.

(b) Basic and acidic media.

11 "Pepsin enzyme that works in the small intestine needs a buffer solution whose pH value equals 1.5, in order to work with a maximum efficiency".

How far is this statement correct ? With explanation.

12 **What happens in case of :** increasing the acidity of stomach above the optimal value for the action of its enzymes ?

13 "In the reactions of the trypsin enzyme, a neutral buffer solution is used to prepare the medium for the enzyme's action". **How far is this statement correct ? With explanation.**

14 "At the normal conditions in lab, the enzyme is used directly with the substrate to perform its action". **How far is this statement correct ? With explanation.**

15 **A student carried out an experiment in lab, where he add pepsin enzyme extracted from a mammal stomach to egg albumin in a test tube. Then incubated at 37°C for 5 minutes and adding Biuret's reagent. Deduce what happens to the reagent ? With explanation.**

16 **The following table shows some enzymes that work in different sites in the digestive system of human and the suitable hydrogen power for the action of each one of them, answer the following :**

Site of enzyme	Enzyme	pH range
Mouth	Salivary amylase	7.2 : 7.5
Stomach	Pepsin	1.5 : 2.5
Small intestine	Pancreatic amylase – Trypsin – Lipase	7.5 : 8

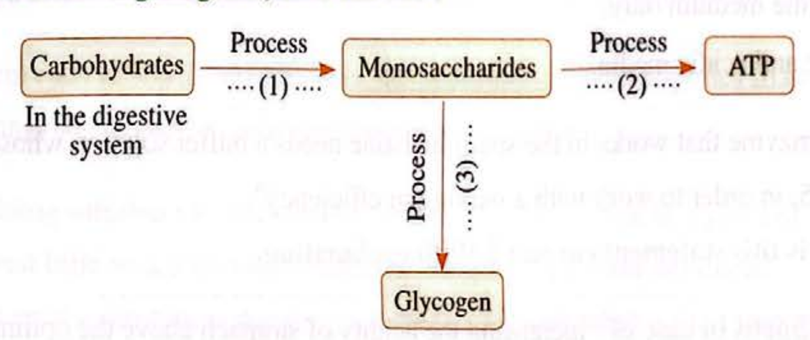
(a) **Predict** the change in salivary amylase enzyme's activity, when it is transferred from mouth to stomach. **Explain your answer.**

(b) **Predict** the change in pepsin enzyme's activity, when it is transferred from stomach to small intestine. **Explain your answer.**

17 "The metabolic processes are reversible".

How far is this statement correct ? With explanation.

18 **Study the following diagram, then answer :**



(a) **What** is the name of processes no. (1), (2) and (3) ?

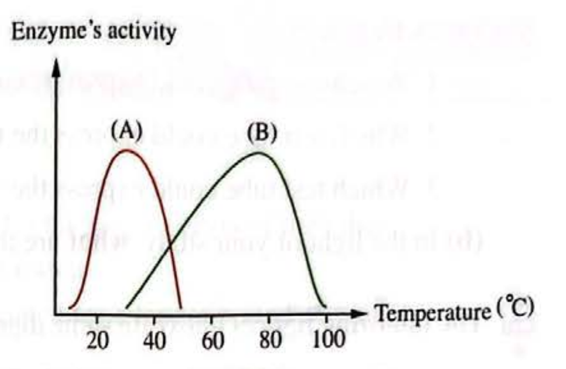
(b) **Where** do the two processes no. (2) and (3) occur inside the human body ? **And what** is the importance of each one of them ?

(c) The process no. (3) depends on the process no. (2), **explain this.**

(d) From the previous diagram, **illustrate** the fate of carbohydrates inside the human body.



19 The opposite graph represents the thermal range of two enzymes (A) and (B), determine **which** of them can be used efficiently in synthesis of clothes detergents, **explain your answer.**



20 **The two following graphs illustrate an experiment to show the effect of amylase enzyme in starch digestion at different laboratory conditions, study them, then answer :**

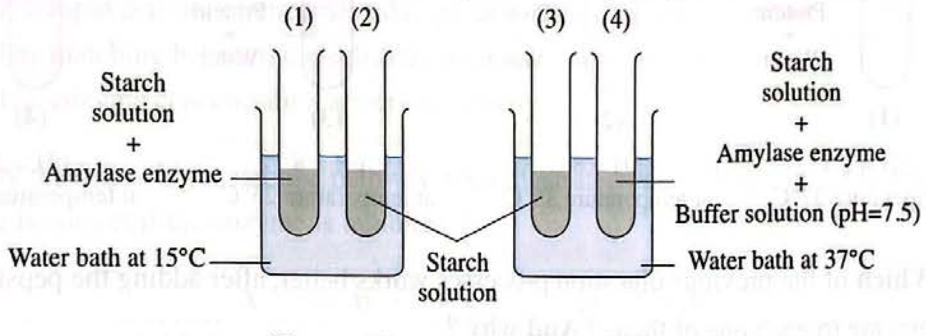
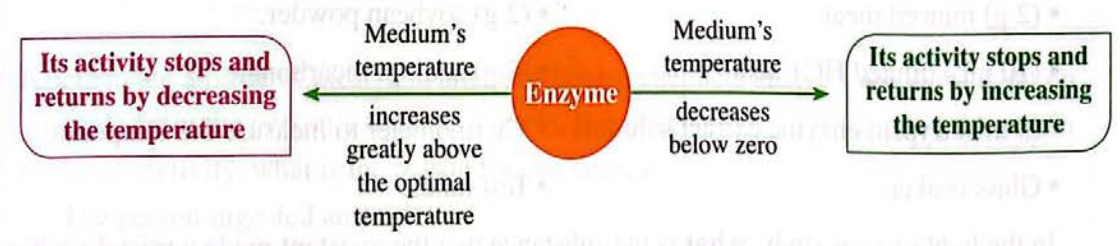


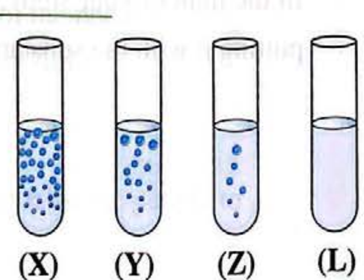
Figure (1) **Figure (2)**

Which of the previous tubes would contain large amount of simple sugar after an hour from the beginning of the experiment ? **Explain your answer.**

21 **The following diagram contains a scientific mistake, mention it with explanation, then draw the correct one :**



22 **The opposite figure shows an experiment to measure the effect of temperature on the activity of catalase enzyme (an enzyme converts hydrogen peroxide into water and oxygen), where equal amounts of the enzyme were added in 4 test tubes (X), (Y), (Z) and (L), each of them contains 2 mL of hydrogen peroxide, as shown in figure, and this occurs at different temperatures :**



(a) Determine :

1. Which test tube could express the minimal temperature for the enzyme's action ?

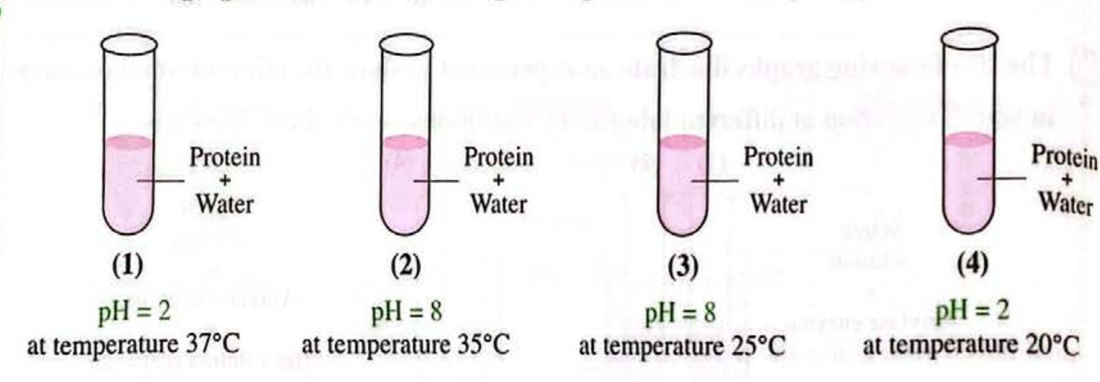
2. Which test tube could express the temperature at which the enzyme's action stops ?

3. Which test tube could express the optimal temperature for the enzyme's action ?

(b) In the light of your study, **what** are the conditions needed for this experiment ?

---

23 The following figures illustrate some digestion processes that may happen in stomach :



(a) Which of the previous digestion processes works better, after adding the pepsin enzyme to each one of them ? **And why ?**

(b) Why don't the other digestion processes occur ?

---

24 To study the effect of trypsin enzyme on the digestion of different protein substances in suitable temperatures for the enzyme's action, the lab assistant prepared the following substances :

- (2 g) minced meat.
- (2 g) soybean powder.
- (10 mL) diluted HCl acid.
- (2 g) sodium bicarbonate.
- (5 mL) trypsin enzyme extract solution.
- Thermometer to measure the temperature.
- Glass beaker.
- Test tubes.

In the light of your study, **what** is the substance that the assistant made a mistake when putting it with the substances that needed for this experiment ? **Explain your answer.**

Questions that measure **high levels of thinking**



Choose the correct answer :

1 • The dried fruits and vegetables can be stored for a longer period of time than the fresh fruits and vegetables without being rotten.

• Some food like jam and molasses can be retained for a longer period of time without being rotten.

What is the reason for the two cases ?

ⓐ The enzyme action is slowed down on the shortage of water.
ⓑ The rapid activity of enzymes takes place on decreasing temperature.
ⓒ The matching between the substrate molecules and enzyme.
ⓓ The enzyme concentration affects its activity.

2 Study the following metabolic pathway, then illustrate, which choice in the following table is correct if the enzyme is inhibited ?

$$A \xrightarrow{(1)} B \xrightarrow{(2)} C \xrightarrow{(3)} D \xrightarrow{(4)} E$$

	Inhibiting enzyme	The affected product
ⓐ	(4)	C
ⓑ	(3)	B
ⓒ	(4)	B
ⓓ	(1)	E

3 A person ate a piece of meat, and after one hour, a chemical analysis was carried out on a sample from the person's stomach content. It is observed that a decrease in the pepsin enzyme's activity, what is the reason for this decrease ?

ⓐ The person ingested antacids.
ⓑ The stomach temperature increases comparing with that of the body.
ⓒ The amount of food that was eaten by this person was very little.
ⓓ This person drank a cup of acidic lemon juice.

4 Which of the following is considered a reason for the inability of some people to extract energy from milk sugar ?

ⓐ The absence of digestive enzymes for lactose.
ⓑ The absence of suitable conditions for the enzyme's action.
ⓒ Lactose molecules are large in size. So, the enzyme can't digest them.
ⓓ The body can't make benefit from the digestion products of lactose.

5 Which of the following is considered a reason for the constancy of the enzymatic reaction rate after a period of time from the beginning of reaction ?

ⓐ The increase in enzyme concentration.

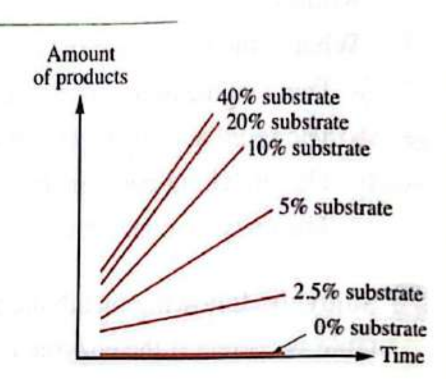
ⓑ The saturation of active sites for enzyme's molecules with the substrate.

ⓒ The increase in the substrate concentration.

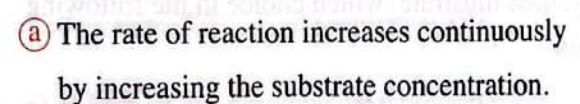
ⓓ The increase in the number of active sites.

---

6 The opposite graph illustrates the effect of the change of substrate concentration on an enzymatic reaction, which of the following statements explains the illustrated results in the graph ?



ⓐ The rate of reaction increases continuously by increasing the substrate concentration.



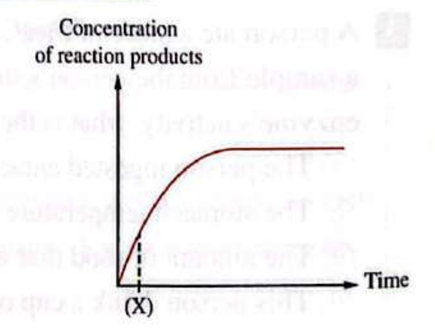
ⓑ The rate of reaction decreases continuously by increasing the substrate concentration.

ⓒ The rate of reaction increases till a certain limit then becomes constant.

ⓓ The rate of reaction isn't affected by increasing the substrate concentration.

---

7 The opposite graph illustrates the relation between the concentration of reaction products and time required for the activity of one of the digestive enzymes at temperature 37°C, which of the following choices expresses what happens at point (X) ?



ⓐ The rate of enzymatic reaction is the least.

ⓑ The rate of enzymatic reaction is the highest.

ⓒ The number of substrate molecules which aren't bound to the enzyme is large.

ⓓ The number of intermediate compounds resulted from the reaction is large.

8 Which of the following statements is correct regarding the following reaction ?

$$\text{Starch} \xrightarrow[\text{pH} = 7.4]{\text{Amylase enzyme}} \text{Maltose sugar}$$

ⓐ When temperature elevates from 25°C to 35°C, the rate of maltose sugar production increases.

ⓑ The concentration of starch isn't affected with passing time.

ⓒ When the amylase enzyme concentration increases, the amount of produced monosaccharide decreases.

ⓓ The enzyme concentration decreases during the reaction with passing time.

---

9 The corn grains which have been recently harvested, their taste is sweety because they contain a high concentration of simple sugars, but on leaving them for a period of time, they lose their sweet taste due to converting most of sugars into starch. On immersing these recently harvested grains in boiled water for a few minutes, then leaving them to cool, their taste remains sweety, even after passing a period of time.

Which of the following enzyme's characteristics explains the previous case ?

ⓐ Enzymes work more rapidly on rising the temperature.

ⓑ Enzymes are damaged by rising temperature.

ⓒ Enzymes are affected by changing pH value.

ⓓ Enzymes are highly specific.

Answer the following question :

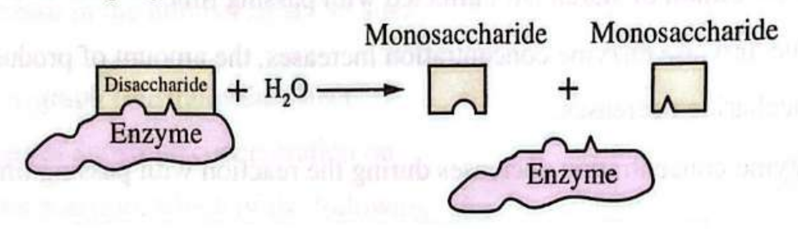
10 Lactic acid bacteria perform anaerobic respiration process, resulting in the production of lactic acid, and this process occurs by specialized enzymes produced by these bacteria, so that they are used in yoghurt industry. **In the light of your study, what are the factors that affect the fermentation process and the conversion of milk into yoghurt within a short time ?**

Test on Chapter 3

Chemical Reactions in Living Organisms' Bodies

First — Choose the correct answer (1 : 14)

▶ Study the following figure, then answer :



1 Which of the following **doesn't** lead to increasing the enzyme's activity in the chemical reaction that is illustrated in the figure ?

ⓐ Increasing the enzyme's concentration.

ⓑ Increasing the disaccharide concentration.

ⓒ Increasing the monosaccharide concentration.

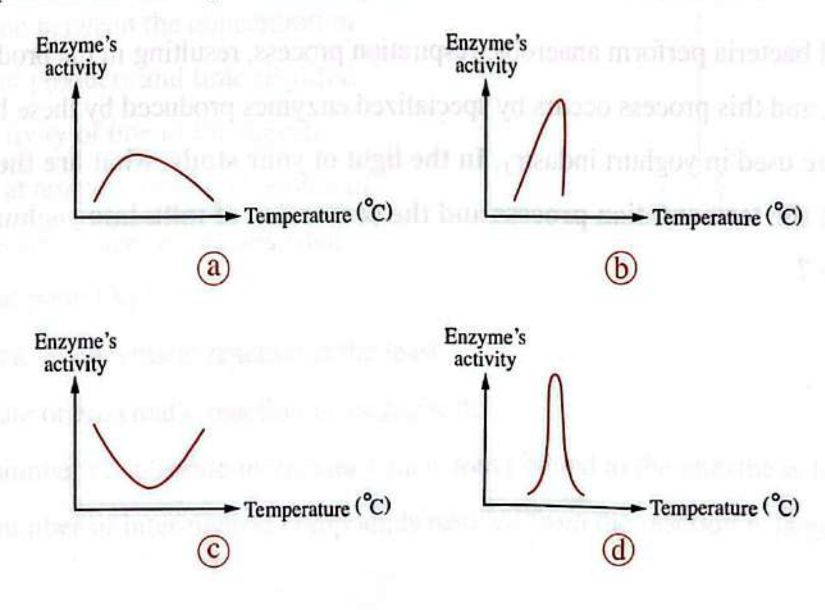
ⓓ Reaching the temperature to the optimal value.

2 What do you conclude from the previous figure according to the enzyme ?

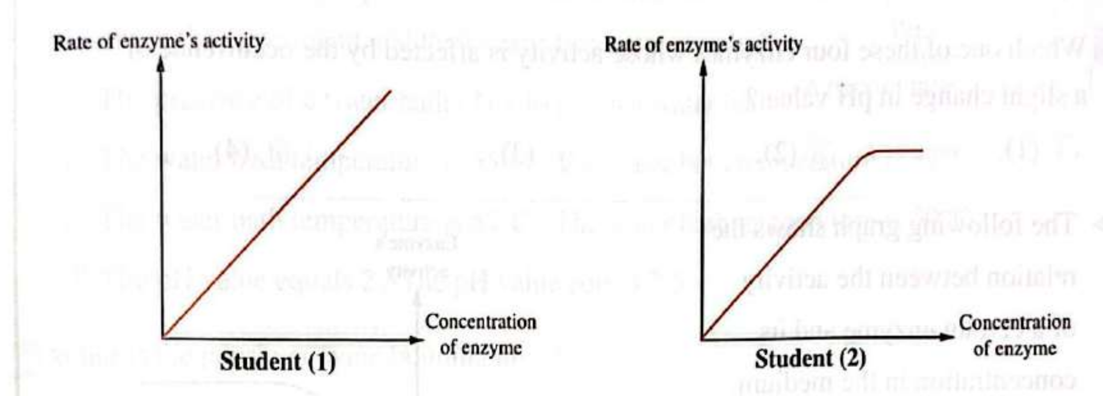
ⓐ Protein substance. ⓑ Fatty substance.

ⓒ Catalyst. ⓓ Inhibitor.

3 If you know that the enzyme (X) is more sensitive for the change in temperature, which graph expresses the activity of this enzyme ?



4 Two students carried out an experiment to study the effect of the concentration of an enzyme on the rate of its activity, then each one of them represented the results that they obtained graphically as shown in the following graphs :



Which statement explains the difference that is illustrated in the experiment of the second student ?

ⓐ He added an inhibitor for the enzyme at the beginning of the experiment.

ⓑ He carried out the experiment in a medium of high temperature.

ⓒ He used a different buffer solution.

ⓓ He used a lower concentration of the substrate.

5 Which of the following processes is considered a catabolic process ?

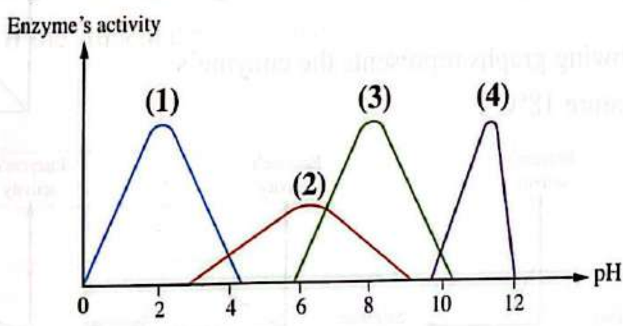
ⓐ The conversion of protein into amino acids in the small intestine.

ⓑ The conversion of glucose into carbon dioxide, water vapour and energy in the muscular cells.

ⓒ The conversion of glycogen into glucose in the muscular cells.

ⓓ The conversion of glucose into glycogen in the liver cells.

▸ Study the following graph which represents the activity of four different enzymes in media of different pH values, study it, then answer :



6 Which one of these four enzymes whose activity stops in the small intestine ?

ⓐ (1). ⓑ (2). ⓒ (3). ⓓ (4).

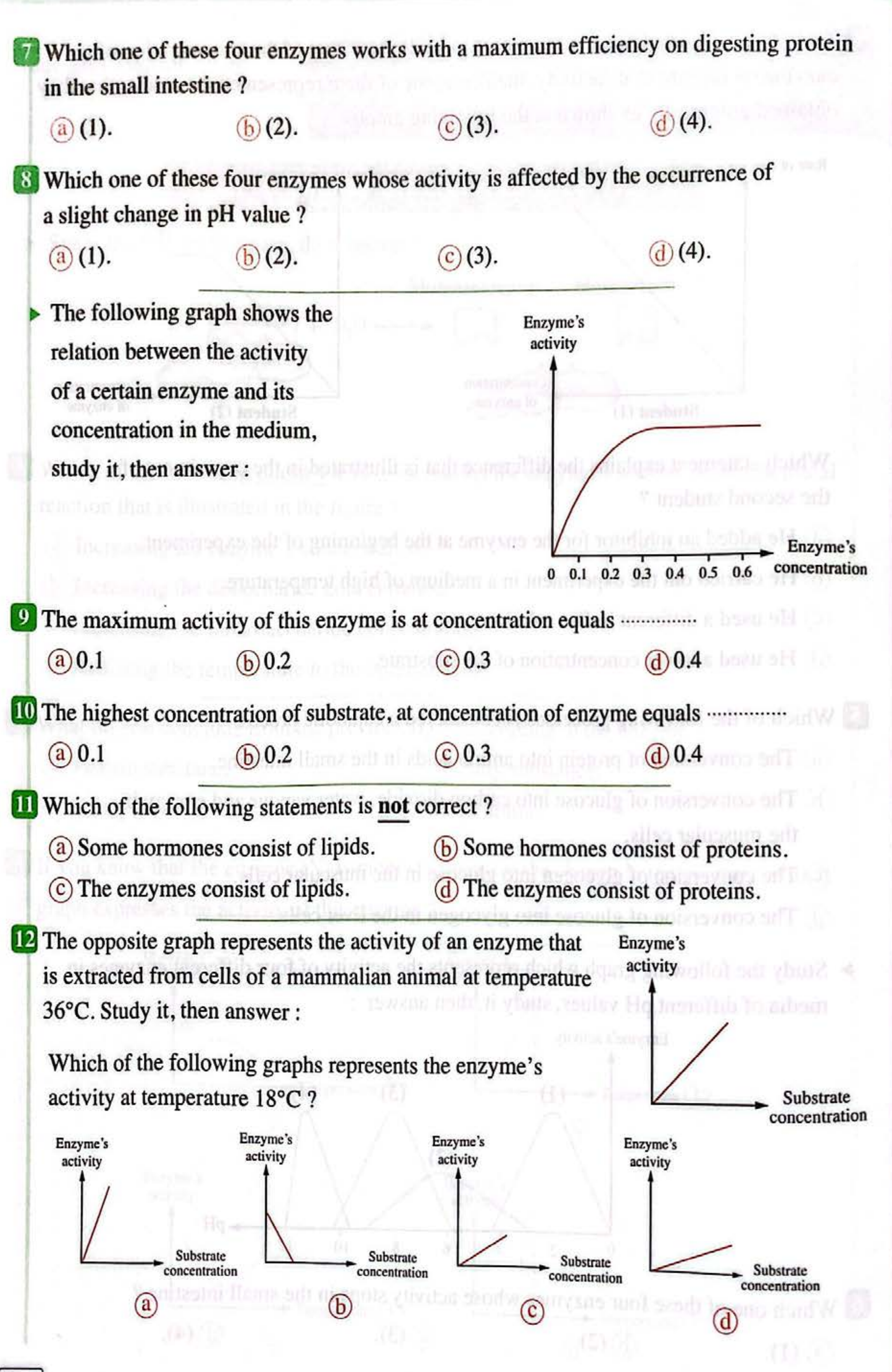
7 Which one of these four enzymes works with a maximum efficiency on digesting protein in the small intestine ?

ⓐ (1). ⓑ (2). ⓒ (3). ⓓ (4).

8 Which one of these four enzymes whose activity is affected by the occurrence of a slight change in pH value ?

ⓐ (1). ⓑ (2). ⓒ (3). ⓓ (4).

▶ The following graph shows the relation between the activity of a certain enzyme and its concentration in the medium, study it, then answer :



9 The maximum activity of this enzyme is at concentration equals ....

ⓐ 0.1 ⓑ 0.2 ⓒ 0.3 ⓓ 0.4

10 The highest concentration of substrate, at concentration of enzyme equals ....

ⓐ 0.1 ⓑ 0.2 ⓒ 0.3 ⓓ 0.4

11 Which of the following statements is **not** correct ?

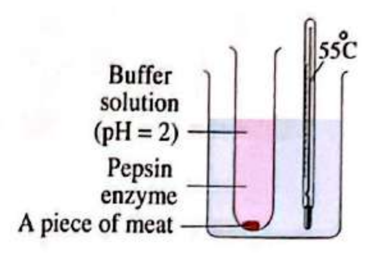
ⓐ Some hormones consist of lipids. ⓑ Some hormones consist of proteins.

ⓒ The enzymes consist of lipids. ⓓ The enzymes consist of proteins.

12 The opposite graph represents the activity of an enzyme that is extracted from cells of a mammalian animal at temperature 36°C. Study it, then answer :

Which of the following graphs represents the enzyme's activity at temperature 18°C ?

13 If you know that pepsin enzyme works on digesting the proteins in stomach, from the opposite figure, which of the following represents the mistakes that are present in the experiment and their correction respectively ?



ⓐ The presence of a water bath / Not to put in a water bath.

ⓑ The water bath temperature is 55°C / The water bath temperature is 37°C

ⓒ The water bath temperature is 55°C / The water bath temperature is 50°C

ⓓ The pH value equals 2 / The pH value equals 7.5

---

14 What is the pepsin enzyme building unit ?

ⓐ Fatty acid. ⓑ Monosaccharide. ⓒ Amino acid. ⓓ Disaccharide.

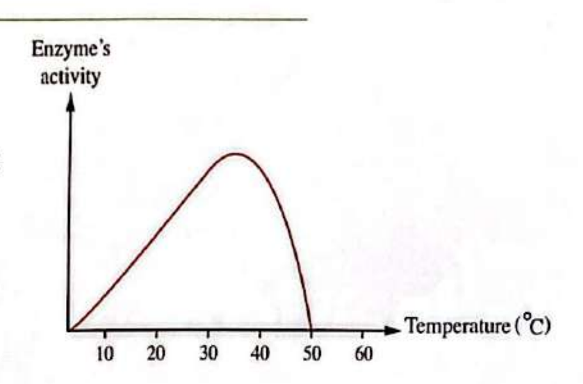
Second Answer the following questions (15 , 16)

15 "Metabolic processes occur in the cells of the digestive system only".

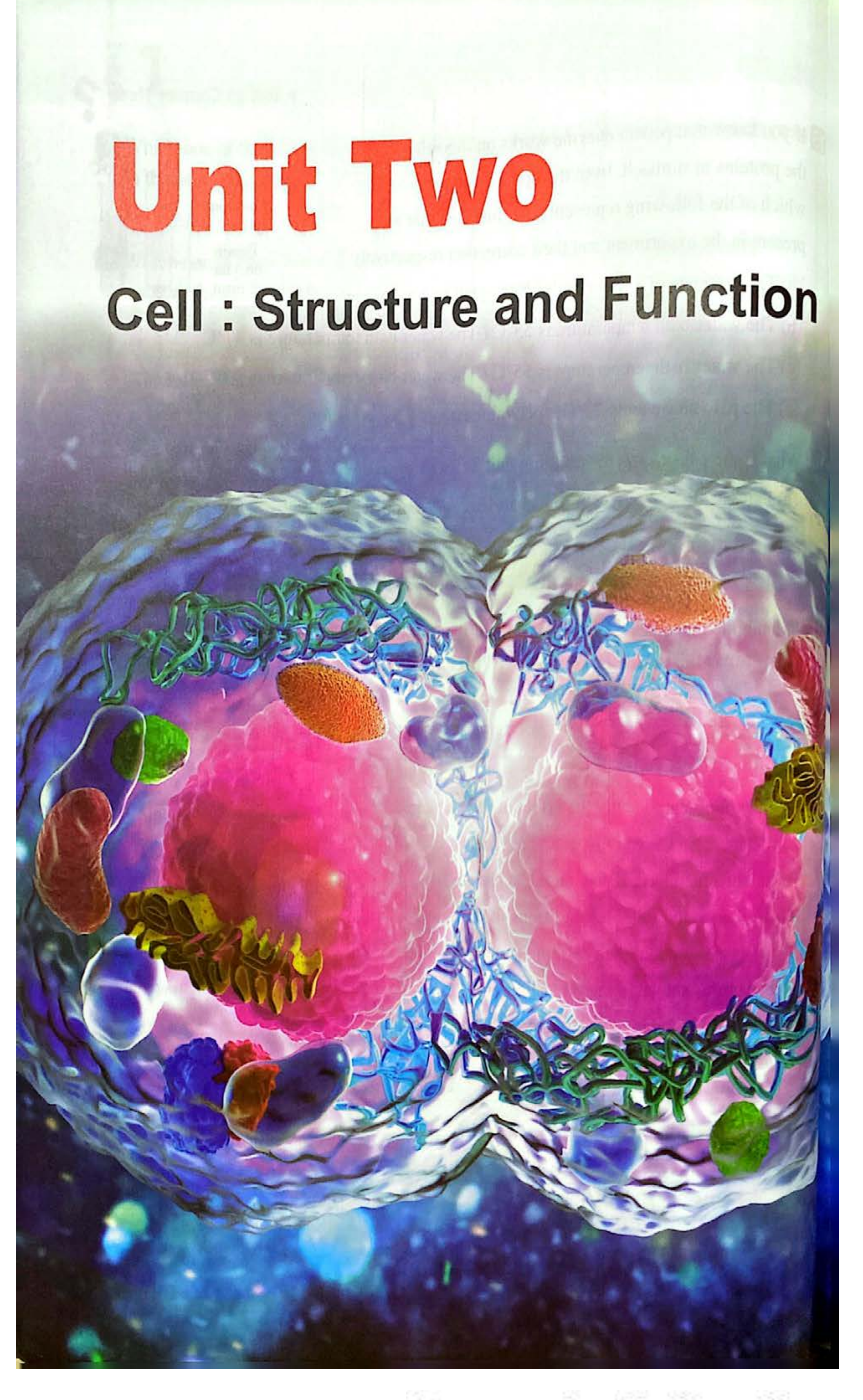
How far is this statement correct ? With explanation.

---

16 In an experiment to study the effect of temperature on the activity of an enzyme, a student added the enzyme on the substrate and provided the suitable conditions for the enzyme's action, then he represented the results as shown in the opposite graph.



What happens if the student decreases the temperature ?


Unit Two
Cell : Structure and Function

Objectives of the unit

By the end of this unit, the student should be able to:

- Explain how the developing of the microscope contributed to state the cell theory.
- Appreciate the efforts of scientists in discovering the cell and their components.
- Explain the principles of the cell theory.
- Compare between the animal and plant cells.
- Draw the accurate structure of the animal and plant cells.
- Examine the animal and plant cells microscopically.
- Identify the organelles of the plant and animal cells and the functions of each one of them.
- Explain the ultrastructure of the cell nucleus and its functions.
- Describe the structure of chromosomes.
- Identify the number of chromosomes in some species of living organisms.
- Explain the structure of the cell wall and its function.
- Explain the ultrastructure of plasma membrane.
- Explain the role of plasma membrane in the process of cellular transport.
- Compare between the prokaryotic and eukaryotic cells.
- Clarify the differentiation of cells into specialized tissues, organs and systems in multicellular animal and plant living organisms.
- Appreciate the grandeur of Allah in the ultrastructure of the cell as a building unit of all living organisms.
- Discard the extremism, fundamentalism and give up clinging the opinion.
- Follow up the scientific methods to solve the problems.

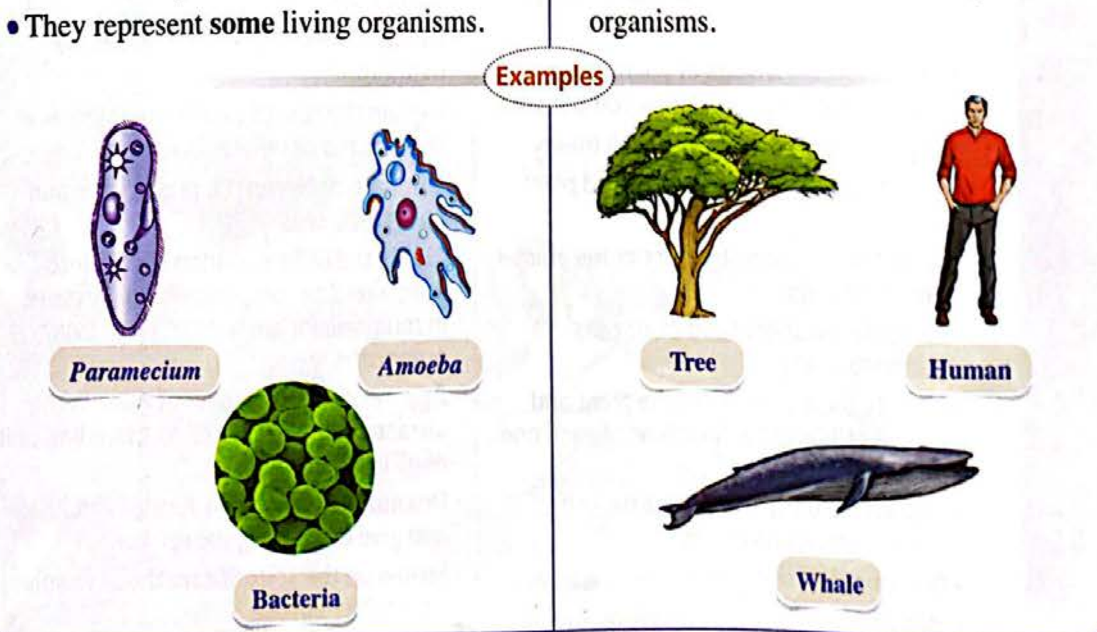
How do you think scientists were able to reach great discoveries in all fields of science ?

Chapter 1 Cell Theory

- **All living organisms are characterized by common characteristics, such as :** Nutrition, transport, respiration, excretion, motion, sensation and reproduction.

☆ Living organisms are divided into :

Unicellular organisms	Multicellular organisms
• Their bodies consist of **one cell** only which performs all the vital activities needed for the continuity of life. • They represent **some** living organisms.	• Their bodies consist of **many cells** which differentiate and specialize in their functions. • They represent **most** of the living organisms.



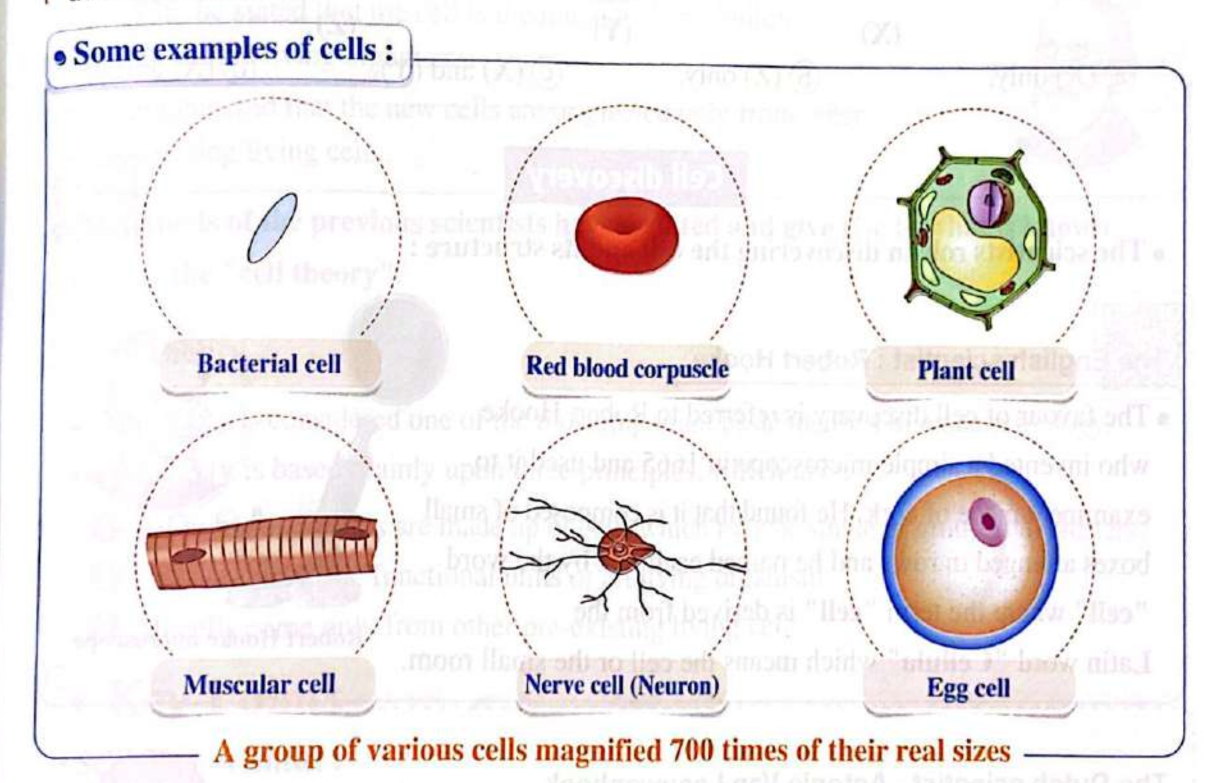
Diversity of cells

☆ There are different types and shapes of cells, some of them look like rods as muscular cells, circular as egg cell or rectangular as onion epidermal cells.

Cell

It is the tiniest building unit in the organism's body that is capable of carrying out all the functions of life.

• **Some examples of cells :**



A group of various cells magnified 700 times of their real sizes

• **From the previous figures, we can conclude that :**

❶ **Cells are varied in shape, structure and size, where :**

- The tiniest cell in size is the bacterial cell.
- The biggest cell in size is the unfertilized egg cell (ostrich egg).

❷ **There is a relationship between the cells shape and the functions that they perform, such as :**

- **Nerve cells (Neurons) :** are the **longest** cells (may reach a meter or little more) to be able to transfer the messages from the spinal cord that is present inside the vertebral column to the farthest parts of the body, such as toes.
- **Muscular cells :** are **cylindrical** and **long**, where the cells are **gathered with each other** to form the muscle fibers which can contract and relax, helping the animal to move.

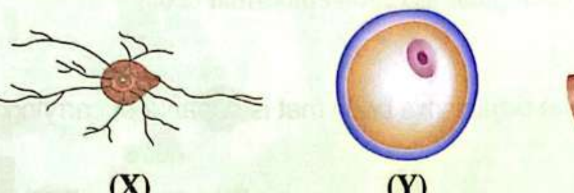


Test yourself



Choose the correct answer :

Which of the following cells play(s) a role in the movement of the human body ?




(X) (Y) (Z)

ⓐ (X) only. ⓑ (Z) only. ⓒ (X) and (Y). ⓓ (X) and (Z).

Cell discovery



- **The scientists role in discovering the cell and its structure :**

The English scientist : Robert Hooke

- The favour of cell discovery is referred to Robert Hooke who invented a simple microscope in 1665 and used it to examine a piece of cork. He found that it is composed of small boxes arranged in rows and he named each box by the word "**cell**" where the term "**cell**" is derived from the Latin word "**Cellula**" which means the cell or the small room.



Robert Hooke microscope

The Dutch scientist : Antonie Van Leeuwenhoek

- He made a simple microscope by using lenses in 1674 with the ability to magnify objects up to 200 times of their real sizes. He used it for examining different substances, such as water of ponds, blood and others. So, Van Leeuwenhoek was the first who observed the world of the microscopic organisms and living cells.



Van Leeuwenhoek microscope

The German scientist : Matthias Schleiden

- In 1838, he deduced that all the plants are composed of cells. He stated his deduction depending on his own researches and those of the other previous scientists.



The German scientist : Theodor Schwann



- In 1839, he deduced that the bodies of all living organisms are composed of cells.

The German doctor : Rudolf Virchow



- In 1855, he stated that the cell is the functional and building unit of all the living organisms.
- He emphasized that the new cells are originated only from other pre-existing living cells.

- **The efforts of the previous scientists have resulted and give rise to what is known now as the "cell theory".**



Cell theory

- Cell theory is considered one of the most important basic theories in modern biology.
- This theory is based mainly upon three principles, **which are :**

1. All living organisms are made up of cells which may be single or grouped in clusters.
2. Cells are the basic functional units of all living organisms.
3. All cells come only from other pre-existing living cells.

Key Points

- **Schleiden scientist :**
  - He is considered the founder of the cell theory.
  - The first one who clarified that the cell is the building unit in plant.
- **Virchow scientist :**
  The first one who proved that the cell is the functional unit for all the living organisms.



Test yourself



Choose the correct answer :

1. From the principles of the biological evolution of living organisms is that each species of the living organisms is originated from other pre-existing living organism's species and simpler in structure, who is the scientist that followed the same principle in the cell discovery ?

ⓐ Theodor Schwann. ⓑ Virchow.
ⓒ Van Leeuwenhoek. ⓓ Schleiden.

2 Which of the following is from the principles of the cell theory ?

ⓐ All cells contain nuclei.

ⓑ All cells contain organelles.

ⓒ The cell is the structural unit of the living organism.

ⓓ The cell contains water.

Development of microscopes

- It is difficult to visualize the cell or its components, due to its very minute size. So, the cell discovery was related to the invention of microscope. Also seeing the cell components was related to the evolution of the microscopes industry till reaching the invention of the electron microscope which has a high magnifying power that enabled us to study the cell structures. **So, there are two types of microscopes :**

FIRST	SECOND
Light microscope	**Electron microscope**

First Light microscope



- Until 1950, the light microscope was the only tool that is available for the scientists to examine the living structures and non-living things.

Idea of its work

It depends on sunlight or artificial light.

Type of used lenses

Glass lenses (ocular and objective).

For illustration only

* ***The light microscope contains different objective lenses that differ in their magnifying power, and the more common ones are :***
  - *Scanning objective lens (4x).*
  - *Low power objective lens (10x).*
  - *High power objective lens (40x).*
  - *Oil immersion lens (100x).*

Functions

1. Magnifying many micro-organisms and non-living things.
2. Examining the composition of large-sized objects after cutting them into very thin slices to allow light to permeate through them.

Magnifying power

- It magnifies objects up to 1500 times of their real sizes and it can't magnify objects more than 1500 times, **because** the image will be unclear (blurred).
- Its magnification power depends on the magnifying power of its ocular and objective lenses.

- **The magnifying power of the microscope can be calculated from the following relation :**

Magnifying power of the light microscope =

Magnifying power of the ocular lens × Magnifying power of the objective lens

- **Example :**

If you know that the magnifying power of the objective lens equals (40x) and the magnifying power of the ocular lens equals (10x). **Calculate the magnifying power of this microscope.**

- **Solution :**

Magnifying power of the microscope = Magnifying power of the objective lens × Magnifying power of the ocular lens = 40 × 10 = 400 times.

Methods of obtaining the clearest image of specimens under the lenses of the light microscope :

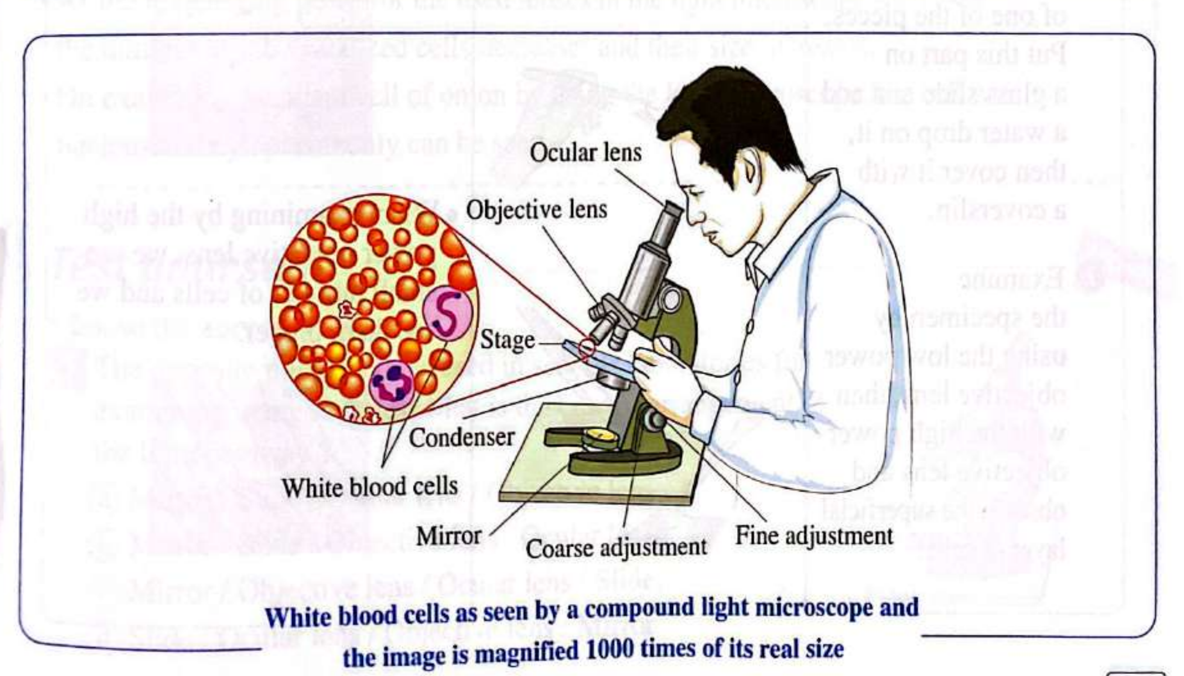
- Scientists found that the best method to examine specimens more clearly is increasing the contrast between different parts of the specimen **by :**

1. Changing the level of lighting (light intensity).
2. Using dyes :
   - These dyes are used to stain or colour certain parts of the specimen to be clearer.

Example : the dye that is added on examining the white blood cells.

Note

From the disadvantages of using dyes is that they kill the living specimens. So, it isn't preferred to add dyes on examining the living specimens, such as protozoans *(Amoeba, Paramecium)* and also yeast fungus.



White blood cells as seen by a compound light microscope and the image is magnified 1000 times of its real size



Test yourself



Choose the correct answer :

1 If the magnifying power of the ocular lens is (20x) and that of the objective lens is (100x), which of the following describes the image that is formed by this microscope ?

ⓐ Clear. ⓑ Accurate. ⓒ Unclear. ⓓ Can't be seen.

2 To examine the types of white blood cells by the light microscope, it is preferred that its magnifying power is ....

ⓐ 10 × 10 ⓑ 10 × 40 ⓒ 10 × 100 ⓓ 40 × 40

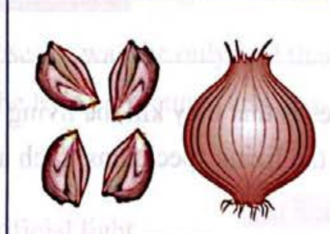
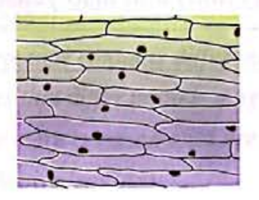
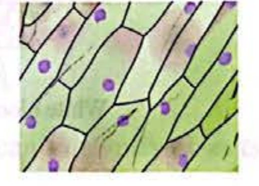


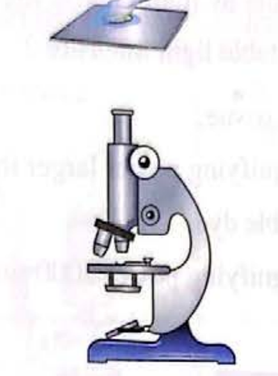
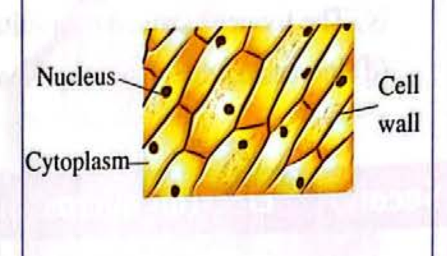
Practical Activity 6 Ideal method to use the compound light microscope



1. Used materials and tools :

- Onion. - Glass slide. - Coverslip. - Forceps. - Compound light microscope.
- Scalpel. - Dropper. - Blotter. - Iodine solution.

Procedure	Figures	Observations
1 Cut the onion into 4 pieces and use the forceps to separate the thin membrane lining the concave surface of one of the pieces. Put this part on a glass slide and add a water drop on it, then cover it with a coverslip.	 	• When examining by the low power objective lens, we see many small-sized hexagonal cells that are arranged in rows adjacent to each other. 
2 Examine the specimen by using the low power objective lens, then with the high power objective lens and observe the superficial layer of cells.		• When examining by the high power objective lens, we see small number of cells and we see them bigger. 

❸ Remove the excess water by using the blotter, then add a drop of iodine at an edge of coverslip where the iodine solution spreads over the specimen. ❹ Re-examine the specimen by using the low power objective lens, then the high power lens and observe the difference.		• When examining by the high power objective lens after adding the iodine solution, we see the cells more clear, due to staining the cell components with orange colour of iodine. 

2. Conclusion :

1. The light microscope is used to magnify the tiny things and examine their components.
2. The light microscope is used in a correct way, when putting a specimen on the slide, then putting it on the stage and using the condenser to control the intensity of light that directed to the slide, then the fine adjustment and coarse adjustment are moved to adjust the ocular and objective lenses for obtaining the clearest image of the specimen.

Key Points

- As the magnifying power of the used lenses in the light microscope increases, the number of the visualized cells decreases and their size increases.
- On examining the plant cell of onion by using the light microscope, the cell wall, nucleus and cytoplasm only can be seen.

4 *Test yourself*

Answered

Choose the correct answer :

1. The opposite microscope is used in schools laboratories for examining many samples, what is the correct arrangement of the light pathway ?



ⓐ Mirror / Slide / Ocular lens / Objective lens.
ⓑ Mirror / Slide / Objective lens / Ocular lens.
ⓒ Mirror / Objective lens / Ocular lens / Slide.
ⓓ Slide / Ocular lens / Objective lens / Mirror.

2 Which of the following increases the contrast degree when examining a specimen of a sclerenchyma tissue by light microscope whose magnifying power of its ocular lens is (15x) with suitable light intensity ?

ⓐ Increasing the thickness of the tissue.

ⓑ Using an objective lens of magnifying power larger than (100x).

ⓒ The tissue is stained by a suitable dye.

ⓓ Increasing the microscope magnifying power 2000 times.

Second Electron microscope

• Since 1950, the scientists started to use the electron microscope.


Electron microscope

Idea of its work

It depends on using a beam of high-speed electrons instead of light.

Type of used lenses

Electromagnetic lenses that control the electrons beam.

Functions

1. Clarifying the cellular components that had not been known before.
2. Knowing more accurate details about the cellular structures that had been known before.

Magnifying power

It magnifies objects till reach one million times or more of their real sizes.

Properties of its images (micrographs)

They are highly magnified and highly contrasted comparatively with those appeared by the light microscope, due to the shortness of wavelength of the electronic ray comparatively with that of the light ray.

Also, they are received on a fluorescent screen or on a highly sensitive photographing board.

Types

1 Scanning electron microscope

- It is used to study the cell surface.



A micrograph of a white blood cell by using the scanning electron microscope (Magnifying power is 3500x).

2 Transmission electron microscope

- It is used to study the cell internal structures.

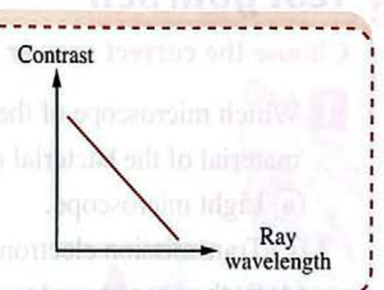


A micrograph of a white blood cell by using the transmission electron microscope (Magnifying power is 8900x).

From the previous figures, it is observed that the micrograph of the white blood cell is clearer by using the transmission electron microscope, due to the easiness of distinguishing its internal components.

Key Points

As the wavelength of the ray used in the microscope is short, the image clearness and contrast increases, therefore the relation between them is inversely.



☆ Comparison between the light microscope and the electron microscope :

P.O.C.	Light microscope	Electron microscope
Idea of work :	Depends on **sunlight** or **artificial light**.	Depends on a **beam of high-speed electrons.**
Type of used lenses :	**Glass** lenses.	**Electromagnetic** lenses.
Magnifying power :	**Low** (maximum magnification doesn't exceed 1500 times of the examined object's real size).	**Very high** (may reach one million times or more of the examined object's real size).
The wavelength of the used ray :	**Longer** comparing with the electron beam.	**Shorter** comparing with the light beam.
Observation method of the specimen :	Through the **ocular lens.**	Through a **fluorescent screen** or on a highly sensitive **photographing board.**
Power of contrast :	**Low**	**Very high**
Functions :	**(1) Magnifying** many micro-organisms and non-living things. **(2) Examining** the composition of large-sized objects after cutting them into very thin slices that allow the light to permeate through them.	**(1) Showing clearly** the cellular components that had not been known before. **(2) Knowing** more accurate details about the structures that had been known before.

5 *Test yourself*



Choose the correct answer :

1 Which microscope of the following is used by the biologists to see the genetic material of the bacterial cell ?

ⓐ Light microscope.
ⓑ Scanning electron microscope.
ⓒ Transmission electron microscope.
ⓓ Both scanning and transmission electron microscopes.

2 The best method to distinguish the different types of blood cells in a certain specimen is using the ....

ⓐ light microscope after adding dyes.
ⓑ light microscope without adding dyes.
ⓒ scanning electron microscope.
ⓓ transmission electron microscope.

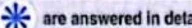
Questions on

Chapter 1

Cell Theory



The questions signed by ✳ are answered in detail.









Interactive test

First Multiple Choice Questions

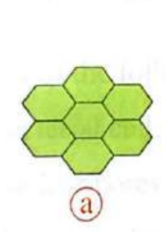
1 What is the similarity among the cells of the stomach tissues ?

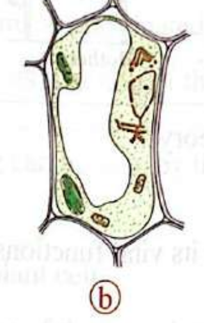
ⓐ Shape. ⓑ The presence of nuclei.

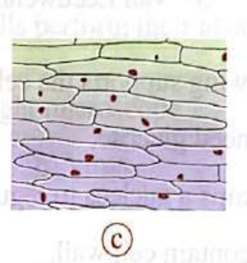
ⓒ Function. ⓓ Size.

2 The opposite figure illustrates a cork tissue, which of the following figures would appear on examining it by using a simple microscope ?




ⓐ


ⓑ


ⓒ

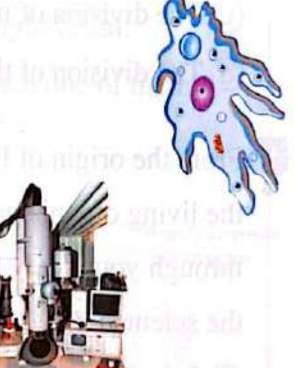

ⓓ

3 Which of the following scientists who could see *Paramecium* for the first time by using lenses with magnifying power that may reach up to 180 times of its real size ?

ⓐ Virchow. ⓑ Robert Hooke.

ⓒ Van Leeuwenhoek. ⓓ Schwann.

4 The opposite figure represents a protozoan "*Amoeba*", which of the following microscopes was used to observe this organism for the first time ?



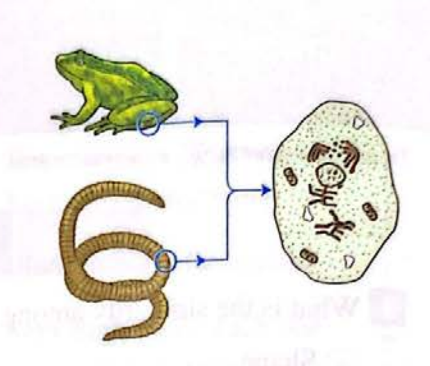

ⓐ


ⓑ


ⓒ

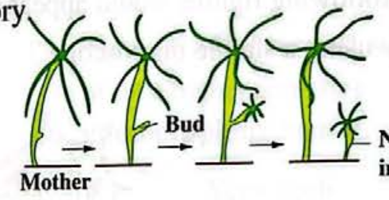

ⓓ

5 The opposite figures illustrate one of the principles of the cell theory, who is the scientist that stated this principle ?



ⓐ Virchow.
ⓑ Van Leeuwenhoek.
ⓒ Schwann.
ⓓ Robert Hooke.

6 The following figure illustrates budding in *Hydra*, where it is a form of asexual reproduction, as it produces a new individual that resembles the mother entirely. In the light of your study for the principles of the cell theory. Who is the scientist that proved this principle ?



ⓐ Virchow. ⓑ Robert Hooke.
ⓒ Schwann. ⓓ Van Leeuwenhoek.

7 Which one of the following supports the cell theory ?
ⓐ All the living cells need glucose.
ⓑ The living cell contains a nucleus to regulate its vital functions.
ⓒ All the living cells contain cell wall.
ⓓ The cell is the basic unit for life.

8 ✻ Which of the following statements **doesn't** support the cell theory ?
ⓐ The division of *Amoeba* cell during asexual reproduction.
ⓑ The division of yeast fungus cell during asexual reproduction.
ⓒ The division of mitochondrion during the cellular division.
ⓓ The division of the bacterial cell during asexual reproduction.

9 From the origin of life theories is the spontaneous generation theory which states that the living organisms could arise suddenly and spontaneously from any non-living matter, through your study to the cell theory, this doesn't agree with the principle that stated by the scientist ....
ⓐ Schwann. ⓑ Schleiden.
ⓒ Virchow. ⓓ Robert Hooke.

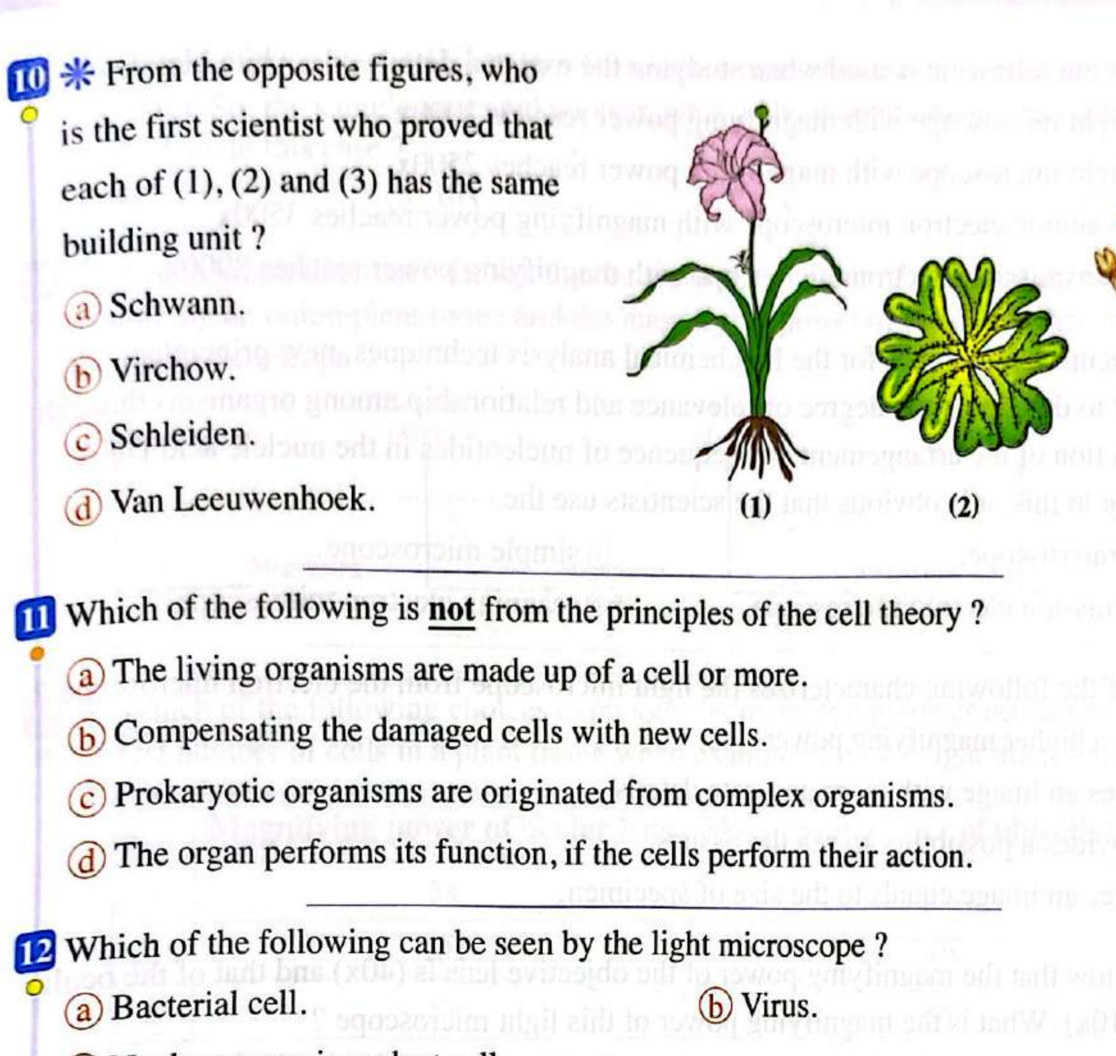
10 * From the opposite figures, who is the first scientist who proved that each of (1), (2) and (3) has the same building unit ?

ⓐ Schwann.

ⓑ Virchow.

ⓒ Schleiden.

ⓓ Van Leeuwenhoek.



11 Which of the following is **not** from the principles of the cell theory ?

ⓐ The living organisms are made up of a cell or more.

ⓑ Compensating the damaged cells with new cells.

ⓒ Prokaryotic organisms are originated from complex organisms.

ⓓ The organ performs its function, if the cells perform their action.

12 Which of the following can be seen by the light microscope ?

ⓐ Bacterial cell.

ⓑ Virus.

ⓒ Nuclear pores in a plant cell.

ⓓ The internal structure of the mitochondrion in an animal cell.

13 The magnifying power of the electron microscope reaches one million times, while that of the light microscope reaches 1500 times, what is the reason for that ?

ⓐ The speed of light is more than that of electrons.

ⓑ The wavelength of the light beam is shorter than that of the electrons beam.

ⓒ The wavelength of the electrons beam is shorter than that of the light beam.

ⓓ The visible light consists of the seven spectrum colours, where each one of them has a different wavelength.

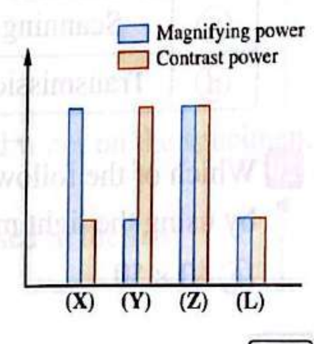
14 From the opposite graph, which of the following illustrates the characteristics of the image of the nucleic acid DNA when examining it by the electron microscope ?

ⓐ (X).

ⓑ (Y).

ⓒ (Z).

ⓓ (L).



15 Which of the following is used when studying the external details of a white blood cell ?

ⓐ The light microscope with magnifying power reaches 2000x

ⓑ The light microscope with magnifying power reaches 2500x

ⓒ The scanning electron microscope with magnifying power reaches 3500x

ⓓ The transmission electron microscope with magnifying power reaches 8900x

16 In the scientific researches for the biochemical analysis techniques, new principles appeared to determine the degree of relevance and relationship among organisms through the deduction of the arrangement and sequence of nucleotides in the nucleic acid DNA, according to this, it is obvious that the scientists use the ....

ⓐ light microscope. ⓑ simple microscope.

ⓒ transmission electron microscope. ⓓ scanning electron microscope.

17 Which of the following characterizes the light microscope from the electron microscope ?

ⓐ It has a higher magnifying power.

ⓑ It gives an image with more accurate details.

ⓒ It provides a possibility to see the tissues.

ⓓ It gives an image equals to the size of specimen.

18 If you know that the magnifying power of the objective lens is (40x) and that of the ocular lens is (10x). What is the magnifying power of this light microscope ?

ⓐ 10 times. ⓑ 40 times. ⓒ 100 times. ⓓ 400 times.

19 The two opposite figures represent two images for a nerve cell, which of the following is correct according to the two opposite figures ?



Figure (1)



Figure (2)

	Figure (1) is examined by	Figure (2) is examined by
ⓐ	Light microscope	Transmission electron microscope
ⓑ	Transmission electron microscope	Scanning electron microscope
ⓒ	Scanning electron microscope	Transmission electron microscope
ⓓ	Transmission electron microscope	Light microscope

20 Which of the following represents the suitable magnifying power to obtain a clear photo by using the light microscope ?

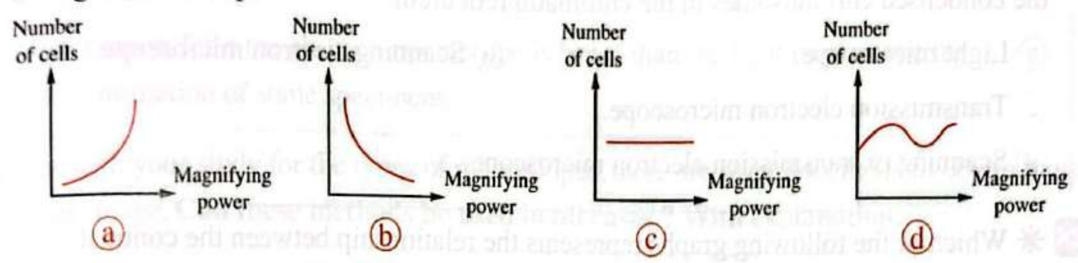
ⓐ 40 × 50 ⓑ 10 × 100 ⓒ 40 × 40 ⓓ 30 × 60



21 A specimen was examined by light microscope whose objective lens magnifying power is (100x). So, the sample appeared unclear, what is the magnifying power of the used ocular lens in this case ?

ⓐ 5x ⓑ 10x ⓒ 15x ⓓ 20x

22 ✻ Which graph illustrates the relation between the number of cells that appear when examining an onion plant tissue and the magnifying power of the lenses that are used in the light microscope ?



23 ✻ Which of the following choices expresses the magnifying power needed to observe the largest number of cells in a plant tissue when examining it by a light microscope ?

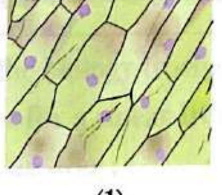
	Magnifying power of ocular lens	Magnifying power of objective lens
ⓐ	5x	10x
ⓑ	10x	10x
ⓒ	5x	40x
ⓓ	10x	40x

24 ✻ Which of the following can't be observed in the plant cell unless using the electron microscope ?

ⓐ Cytoplasm. ⓑ Plasma membrane.

ⓒ Nucleus. ⓓ Cell wall.

25 A student examined some plant cells by using the light microscope. At the beginning, he observed figure no. (1), then he carried out a certain procedure and observed figure no. (2) as shown in the following figures. What did the student carry out to obtain figure no. (2) ?



(1) (2)

ⓐ He added a dye on the specimen. ⓑ He added distilled water on the specimen.

ⓒ He added ethyl alcohol on the specimen.

ⓓ He used a lens with higher magnifying power than that which used in the first examination.

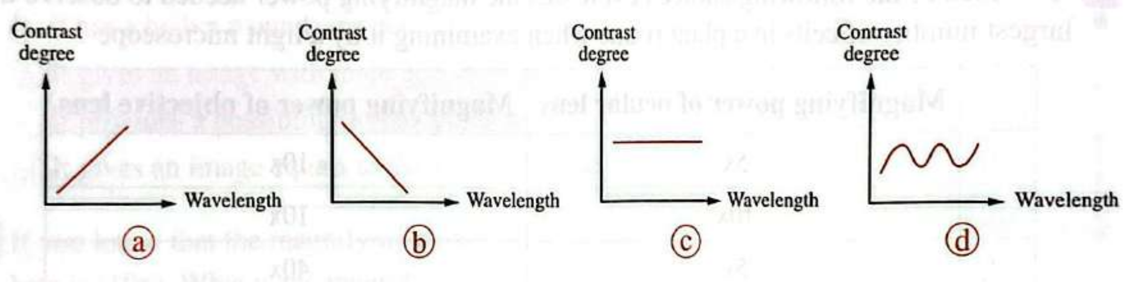
26 When examining a slice of onion cells under the microscope in order to see the genetic material in them, how much magnifying power would the used microscope reach ?

ⓐ 100x ⓑ 1500x
ⓒ 7000x ⓓ One million times.

27 Which of the following microscopes is the most suitable for seeing the accurate details of the condensed chromosomes in the chromatin reticulum ?

ⓐ Light microscope. ⓑ Scanning electron microscope.
ⓒ Transmission electron microscope.
ⓓ Scanning or transmission electron microscope.

28 ✻ Which of the following graphs represents the relationship between the contrast degree of the image and the wavelength of the used rays in the microscopes ?



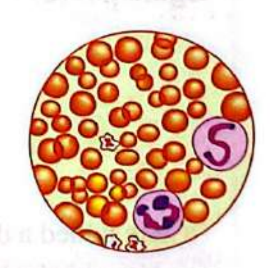
29 In front of you, two figures no. (1) and no. (2) of a sample from the same living organism under the light microscope, how is figure no. (1) changed into figure no. (2) ?


Figure (1)


Figure (2)

ⓐ Changing light intensity.
ⓑ Adding dye.
ⓒ Using an objective lens with a higher magnifying power.
ⓓ Using an objective lens with a lower magnifying power.

30 ✻ On examining the opposite sample using the light microscope, where the magnifying power of the ocular lens equals (10x). What is the magnifying power of the objective lens ?



ⓐ 10 times. ⓑ 100 times.
ⓒ 1000 times. ⓓ 10000 times.



31 ✳ Which of the following represents the most suitable method to examine the flagella distribution on the surface of some types of bacteria ?

ⓐ Magnifying lens.
ⓑ Compound microscope.
ⓒ Scanning electron microscope.
ⓓ Transmission electron microscope.

Second Miscellaneous Questions

1 **Give reason for :** the electron microscope is better than the light microscope in the examination of some specimens.

2 Through your study for the types of microscopes, there are several methods to obtain more clear image. **Can these methods be used in all cases ? With explanation.**

3 You have read in a newspaper that a new unicellular organism was discovered. **In the light of your study to the cell theory, write what do you know about this organism without seeing or examining it.**

4 **The two opposite figures illustrate two different types of the optical devices :**
Identify each one, then **illustrate** the purpose in which they are used.



Figure (1)



Figure (2)

5 **What is the difference between :** the building unit of the nervous system and the building unit of the muscular system ?

6 **Give reason for :** it is not preferred to add dyes to *Amoeba* on examination.

7 **What happens in case of :** magnifying a specimen of an animal tissue by using the light microscope more than 1500 times of its real size ?

8 **In the school lab, the biology teacher asked you to prepare two slides, one from pond water and the other for a smear from the lining membrane of the mouth.**
In the light of this, answer :

(a) **Which** one of the two slides is preferred to be prepared with adding dyes ?
Explain your answer.

(b) **What** are the precautions that should be taken in order to obtain a clear image for the specimens under study ?

9 **What happens in case of :**

(a) Using dyes to examine a specimen ?

(b) Adding red eosin dye to *Amoeba* during its division ?

10 "The living cells are arisen spontaneously from non-living things".

How far is this statement correct ? With explanation.

11 **The following table illustrates some characteristics of three different microscopes :**

	Microscope (1)	Microscope (2)	Microscope (3)
Contrast	Low	High	High
Wavelength	Long	Short	Short
Magnifying power	1500	3500	9000

Write the number and the name of the microscope through which each of the following can be seen :

(a) The cell wall and its pores.

(b) The internal membrane of the mitochondria.

(c) A cell inside a human skin tissue.

Test on Chapter 1

Cell Theory

First Choose the correct answer (1 : 14)

1 Who is the founder scientist of the cell theory ?

ⓐ Robert Hooke. ⓑ Theodor schwann.

ⓒ Schleiden. ⓓ Virchow.

2 Light microscope with magnifying power equals (400x), if the magnifying power of its objective lens is (40x), therefore what is the magnifying power of its ocular lens ?

ⓐ (1x). ⓑ (10x).

ⓒ (100x). ⓓ (1000x).

3 Who is the first scientist who proved that the cell is the functional unit of the living organisms ?

ⓐ Robert Hooke. ⓑ Theodor Schwann.

ⓒ Schleiden. ⓓ Virchow.

4 Why Schleiden was considered to be the first scientist who clarified that the cell is the building unit ?

ⓐ He was the first who observed the microscopic organisms.

ⓑ He was the first who examined an animal tissue and found that it consists of cells.

ⓒ He was the first who examined a plant tissue and found that it consists of cells.

ⓓ He was the first who made a compound light microscope.

5 Who is the first scientist who could see the red blood cells by using a microscope ?

ⓐ Van Leeuwenhoek. ⓑ Robert Hooke.

ⓒ Schleiden. ⓓ Virchow.

6 Which of the following microscopes is used in studying the details of the external membrane surface of the mitochondrion in a muscular cell ?

ⓐ Simple microscope. ⓑ Light microscope.

ⓒ Scanning electron microscope. ⓓ Transmission electron microscope.

7 In bio-lab, a student observed some phenomena on carrying out an examination by using the compound microscope. Which one of these phenomena supports the cell theory ?

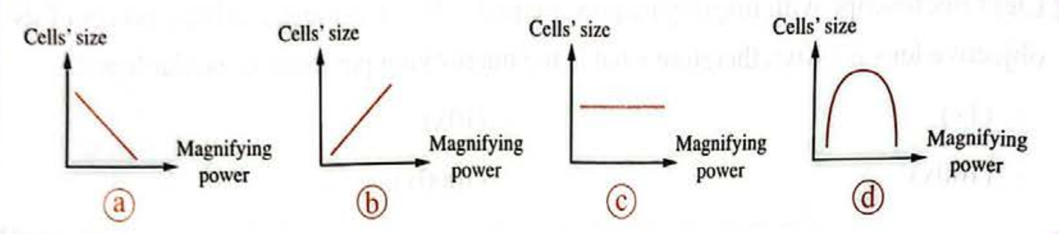
ⓐ Skeletal muscle fiber contains several nuclei.

ⓑ Mature red blood cells don't contain nuclei.

ⓒ New cells are formed from the cellular division.

ⓓ The cells of the endocrine glands tissue contain nuclei.

8 Which of the following graphs expresses the relation between the size of cells of a certain tissue in a leaf of the corn plant and the magnifying power of the light microscope lenses that are used in examination ?



9 When the magnifying power of the ocular lens for a light microscope is (30x), what is the magnifying power of the objective lens to obtain the maximum magnifying power for this microscope ?

ⓐ (10x). ⓑ (30x). ⓒ (50x). ⓓ (70x).

10 **(1)** The living organisms are originated spontaneously.

(2) All the living organisms consist of cells either single or grouped.

(3) The cell is the building and functional unit for all the living organisms.

Which one of the previous statements **doesn't/don't** support the cell theory ?

ⓐ (1)only. ⓑ (2) and (3). ⓒ (1) and (3). ⓓ (3) only.

11 Which of the following procedures **can't** be used on distinguishing among different types of white blood cells by using the compound microscope ?

ⓐ Using dyes.

ⓑ Changing the light intensity.

ⓒ Using the magnifying power of the microscope = 1000x

ⓓ Using the magnifying power of the microscope = 2500x

12 Which of the following represents the most suitable method to examine the micro-structure of the nucleus ?

ⓐ Magnifying lens.
ⓑ Light microscope.
ⓒ Scanning electron microscope.
ⓓ Transmission electron microscope.

13 The opposite figure illustrates the preparing method to examine a specimen of a plant tissue by the light microscope, why is the specimen covered by a coverslip with a certain angle as shown in the figure ?

Coverslip

Specimen + Iodine drop

ⓐ To see the specimen with its original size.
ⓑ To reduce the presence of air bubbles.
ⓒ To reduce the size of specimen.
ⓓ To be clearer and transparent.

14 How far are these statements "Cellulose fibers of the epidermal cell wall of onion plant can be seen by the light microscope", "Also, the chromosomes can be seen during the cellular division by the electron microscope only", correct ?

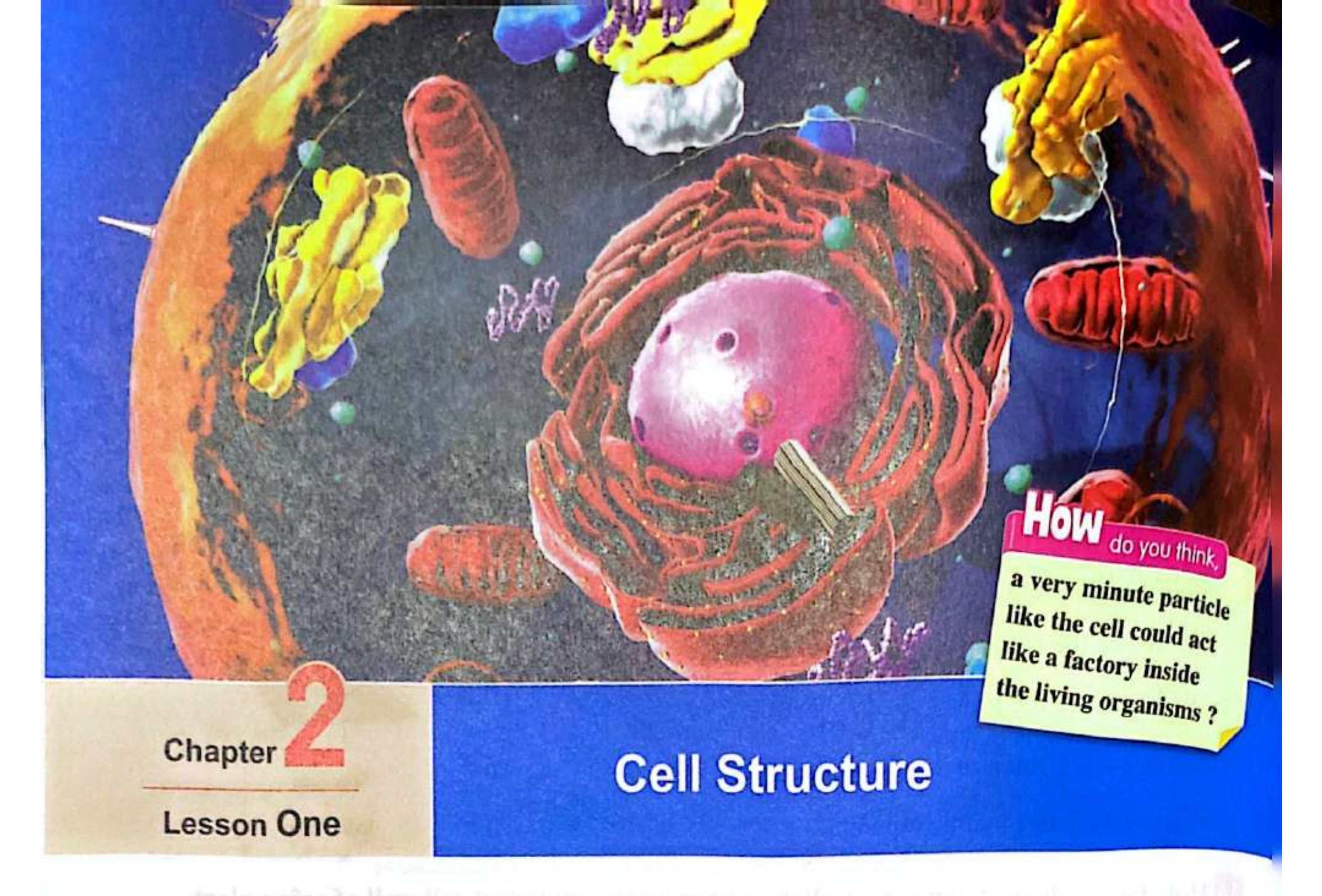
ⓐ The two statements are correct.
ⓑ The first statment is correct and the second statement is wrong.
ⓒ The first statement is wrong and the second statement is correct.
ⓓ The two statements are wrong.

Second Answer the following questions (15 , 16)

15 "All the living organisms consist of a group of cells that are attached to each other".

How far is this statement correct ? With explanation.

16 The cell theory was arisen, as a result of the efforts of three scientists, **mention the role of each scientist.**



Chapter 2

Lesson One

Cell Structure

• **We knew previously that :**

The cell is the functional and building unit in all living organisms, and is characterized by its ability to grow, reproduce, respond to the external stimuli and perform the different metabolic processes.

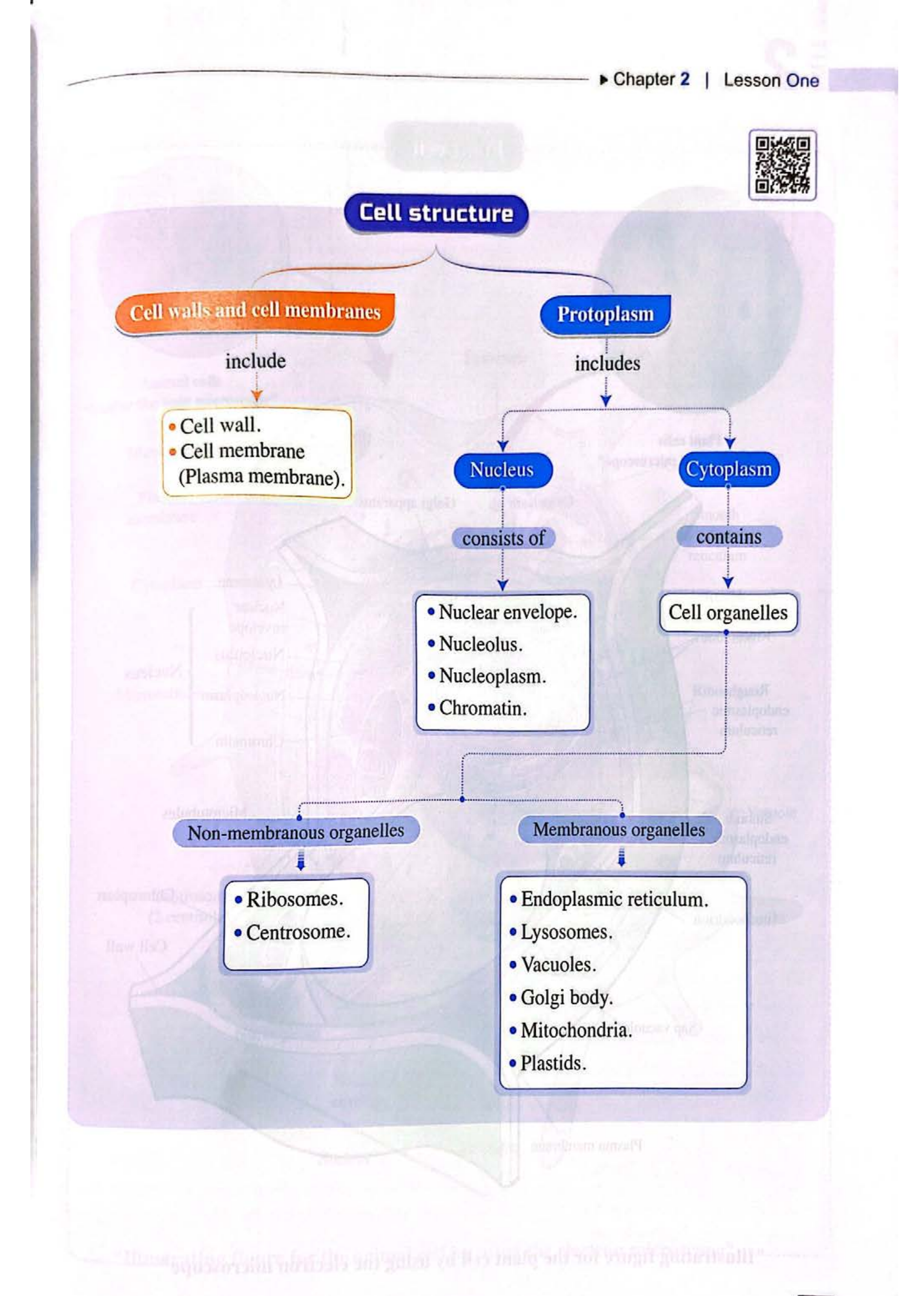
• **We will study :**

- How can the cell perform all these functions ?
- What are the structures that are present in the cell and enable it to perform these functions ?

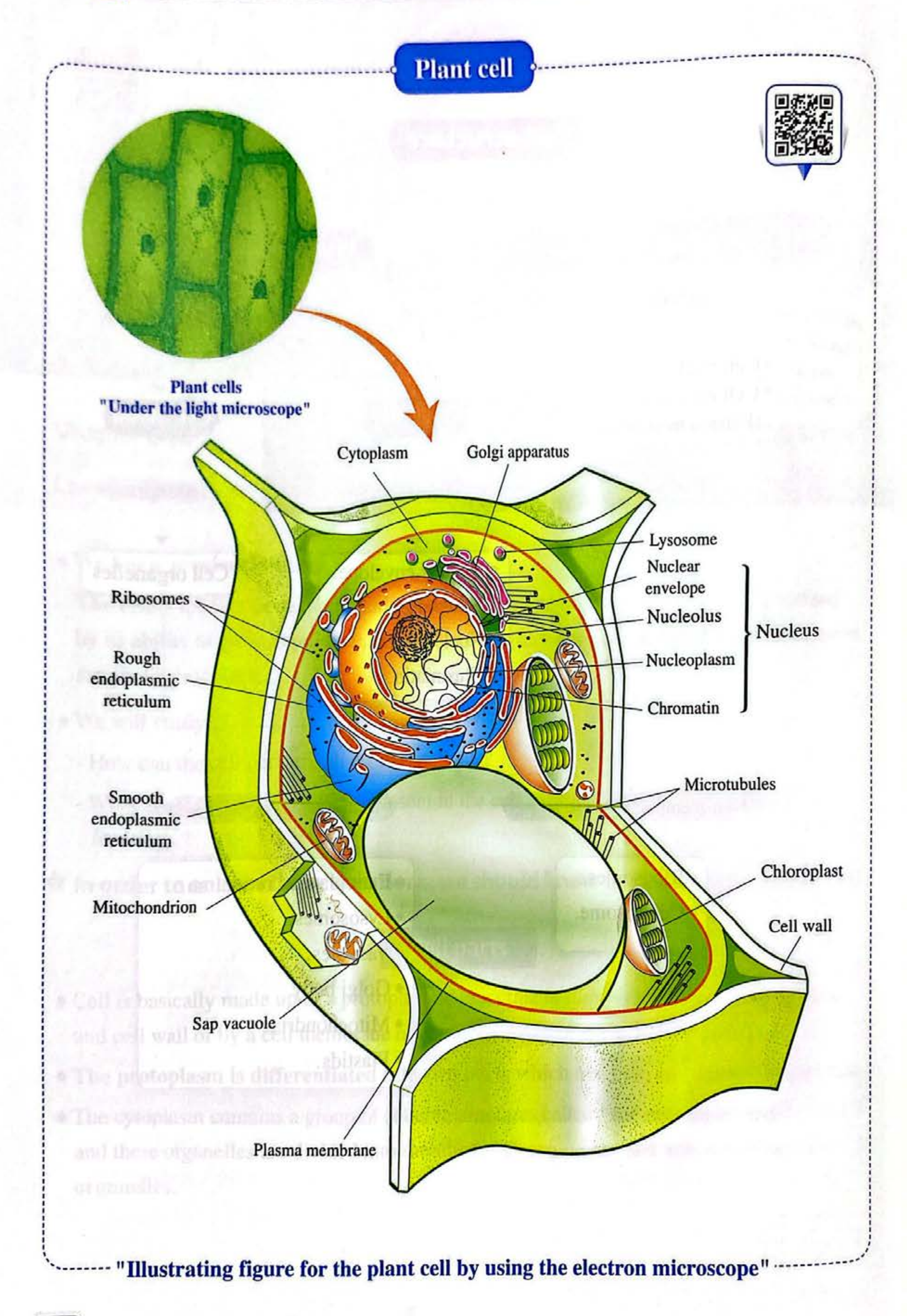
In order to answer these questions, we should know the main parts of the cell :

Cell parts

- Cell is basically made up of a protoplasmic mass that is surrounded by a cell membrane and cell wall or by a cell membrane only.
- **The protoplasm is differentiated into two parts which are :** the nucleus and cytoplasm.
- The cytoplasm contains a group of cellular structures called "**the cell organelles**", and these organelles are divided into membranous organelles and non-membranous organelles.

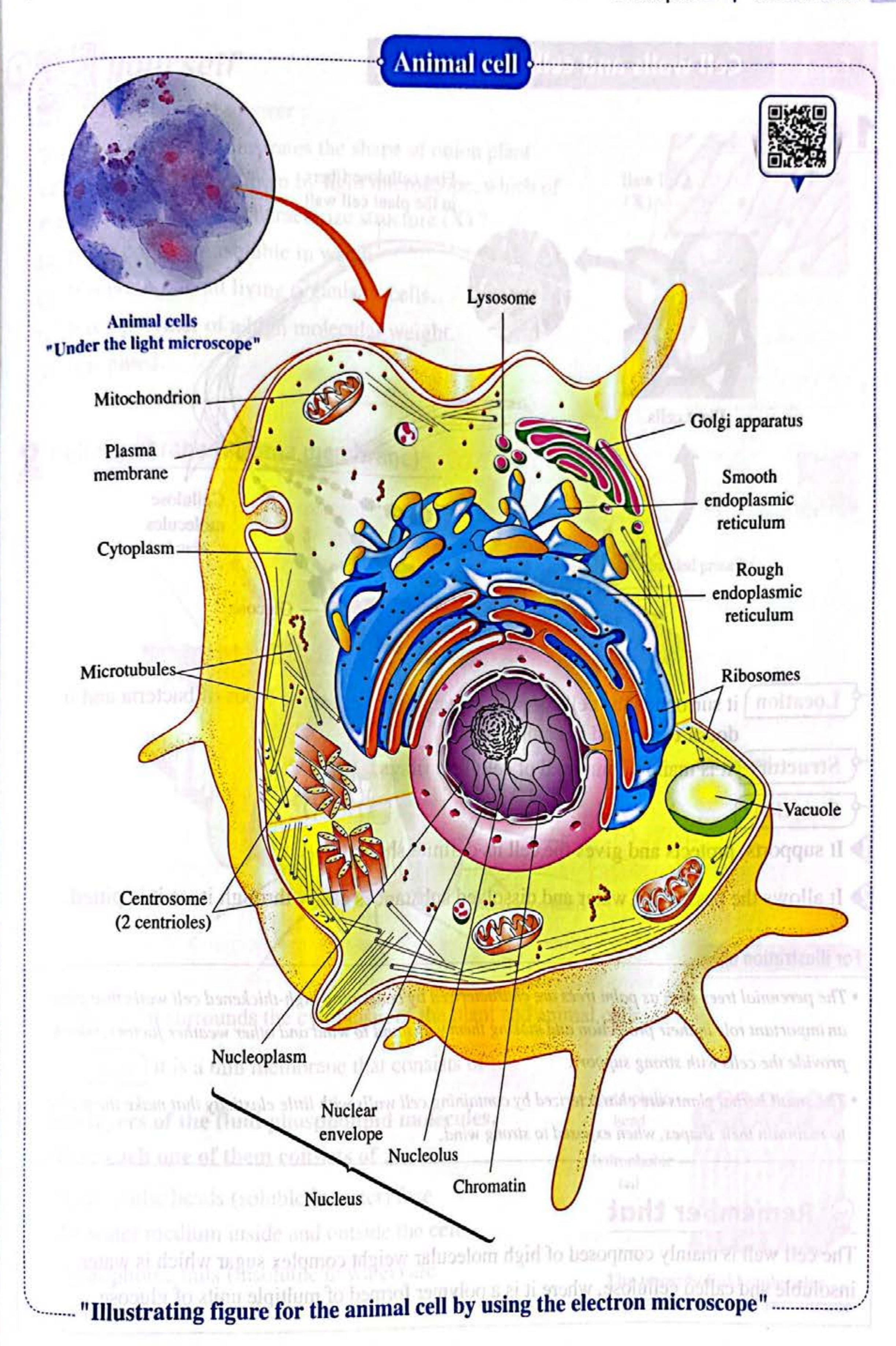

Cell structure
Cell walls and cell membranes
include
• Cell wall.
• Cell membrane (Plasma membrane).
Protoplasm
includes
Nucleus
consists of
• Nuclear envelope.
• Nucleolus.
• Nucleoplasm.
• Chromatin.
Cytoplasm
contains
Cell organelles
Non-membranous organelles
• Ribosomes.
• Centrosome.
Membranous organelles
• Endoplasmic reticulum.
• Lysosomes.
• Vacuoles.
• Golgi body.
• Mitochondria.
• Plastids.

Plant cell



"Illustrating figure for the plant cell by using the electron microscope"

Animal cell

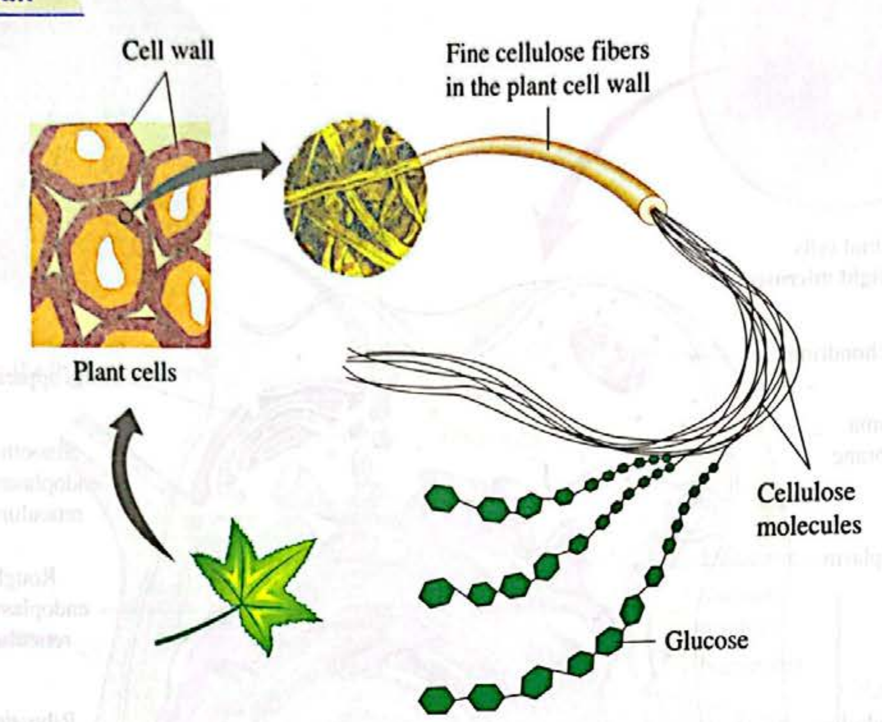


"Illustrating figure for the animal cell by using the electron microscope"



First Cell walls and cell membranes

1 Cell wall



Location it surrounds the cells of plant, algae, fungi and some types of bacteria and it doesn't surround the animal cells.

Structure it is mainly composed of cellulose fibers.

Functions

1. It supports, protects and gives the cell its definite shape.
2. It allows the passage of water and dissolved substances easily through it, as it is pitted.

For illustration only

- *The perennial trees such as palm trees are characterized by containing high-thickened cell walls that play an important role in their protection and making them withstand to wind and other weather factors, which provide the cells with strong support.*
- *The small herbal plants are characterized by containing cell walls with little elasticity that make them able to maintain their shapes, when exposed to strong wind.*

Remember that

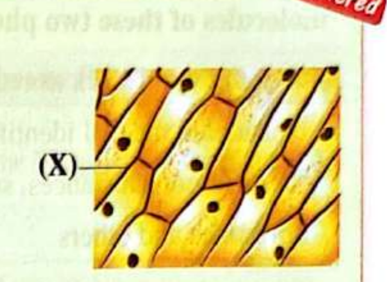
The cell wall is mainly composed of high molecular weight complex sugar which is water insoluble and called cellulose, where it is a polymer formed of multiple units of glucose.

1 Test yourself

Answered

Choose the correct answer :

The opposite figure illustrates the shape of onion plant cells when examining them by light microscope, which of the following **doesn't** characterize structure (X) ?



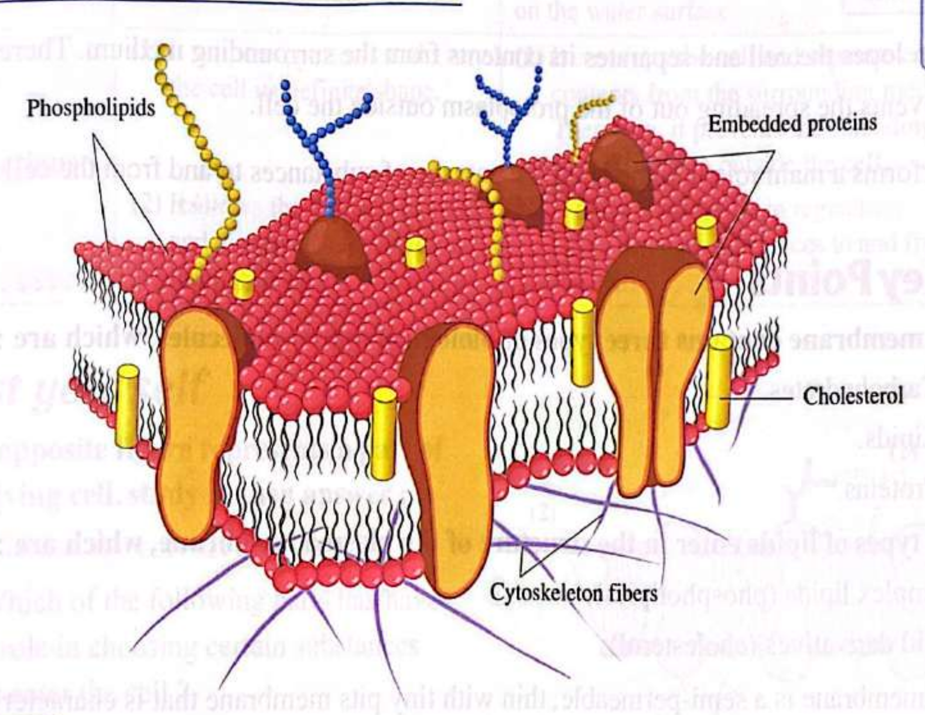
ⓐ It is a polymer insoluble in water.

ⓑ It is present in all living organisms cells.

ⓒ It is a polymer of a high molecular weight.

ⓓ It is pitted.

2 Cell membrane (Plasma membrane)

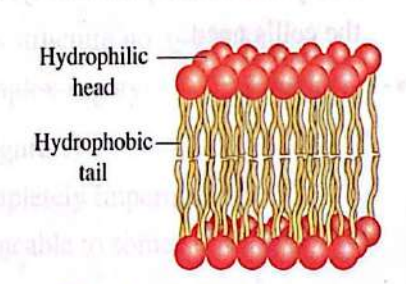


Location it surrounds the cytoplasm of the plant and animal cells.

Structure it is a thin membrane that consists of :

1 Two layers of the fluid phospholipid molecules, where each one of them consists of :

- Hydrophilic heads (soluble in water) face the water medium inside and outside the cell.
- Hydrophobic tails (insoluble in water) are found inside the membrane.



The phospholipid molecules arrangement in the cell membrane

2. **Molecules of protein that are embedded among the molecules of these two phospholipid layers, where :**
   - Some of them work as receptors as they are considered the cell identification sites for different substances, such as nutrients, hormones and others.
   - Some others work as gates for the passage of substances to and from the cell.

Note

Cell membrane is a fluid structure that is similar to a layer of oil on the water surface, because phospholipids which form it are considered a fluid substance.

3. **Molecules of cholesterol substance** are linked with phospholipid molecules for maintaining the cell membrane cohesive and intact.

Functions

1. It envelopes the cell and separates its contents from the surrounding medium. Therefore, it prevents the spreading out of the protoplasm outside the cell.
2. It performs a main role in organizing the passage of substances to and from the cell.

Key Points

- **Cell membrane contains three types of biological macro-molecules, which are :**
  (1) Carbohydrates.
  (2) Lipids.
  (3) Proteins.
- **Two types of lipids enter in the structure of the plasma membrane, which are :**
  - Complex lipids (phospholipids).
  - Lipid derivatives (cholesterol).
- Cell membrane is a semi-permeable, thin with tiny pits membrane that is characterized by selective permeability, where it allows the passage of some substances through it freely and others pass slowly, and prevents the passage of other substances according to the cell's need.

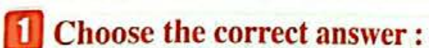
☆ From the previous, we can make a comparison between the cell wall and cell membrane, as follows :

P.O.C.	Cell wall	Cell membrane (Plasma membrane)
Location :	It surrounds the plant cells, algae, fungi and some types of bacteria and it doesn't surround the animal cells.	It surrounds the cytoplasm of the plant and animal cells.
Structure :	It consists mainly of cellulose fibers.	• It consists of two layers of phospholipids, where : - Protein molecules are embedded among their molecules. - They are linked with the cholesterol substance molecules.
Description :	Pitted envelope.	Thin membrane that is similar to the oil layer on the water surface.
Functions :	(1) It supports, protects and gives the cell its definite shape. (2) It allows the passage of water and dissolved substances through it easily.	(1) It envelops the cell and separates its contents from the surrounding medium. Therefore, it prevents the spreading out of the protoplasm outside the cell. (2) It plays a main role in regulating the passage of substances to and from the cell.

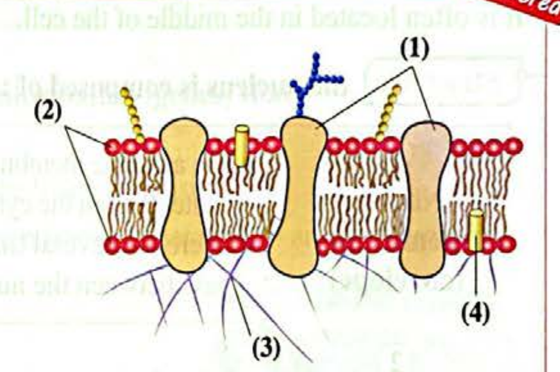
Test yourself

Answered

The opposite figure represents a part of the living cell, study it, then answer :



1 Choose the correct answer :



(1) Which of the following parts has/have a role in choosing certain substances to enter the cell ?

ⓐ (1) only. ⓑ (2) only.
ⓒ (1) and (3). ⓓ (2) and (4).

(2) To which of the following biological macro-molecules structure no. (4) belongs ?

ⓐ Lipid derivatives. ⓑ Complex lipids. ⓒ Complex sugars. ⓓ Proteins.

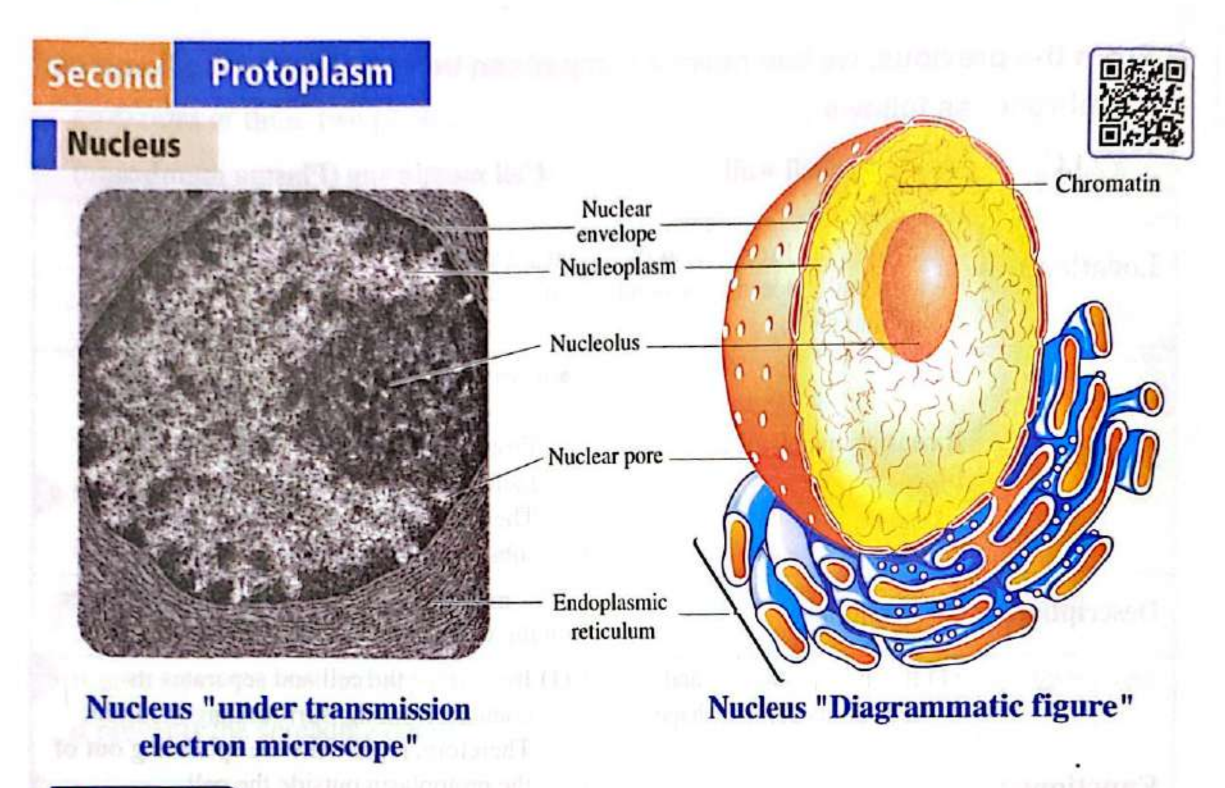
(3) Which of the following properties characterizes this figure ?

ⓐ Completely permeable. ⓑ Completely impermeable.
ⓒ Permeable to water only. ⓓ Permeable to some substances.

2 What is the molecular structure of part no. (2)?

Second Protoplasm

Nucleus



Nucleus "under transmission electron microscope"

Nucleus "Diagrammatic figure"

Description

It has a spherical or oval shape, which is the most obvious organelle in the cell that can be seen under the microscope.

Location

It is often located in the middle of the cell.

Structure the nucleus is composed of :

① Nuclear membrane (envelope)	• It is a double membrane surrounds the nucleus and separates its contents from the cytoplasm. • There are several tiny pores in it, through which the substances pass between the nucleus and cytoplasm.
② Nucleoplasm	• It is a transparent gelatinous fluid inside the nucleus. • It contains the nucleolus and chromatin.
③ Nucleolus	More than one nucleolus may be found in the nucleus, especially in the cells that are specialized in synthesizing and secreting protein substances, such as : enzymes, hormones and others.
④ Chromatin	• It is minute tangled filaments that are coiled around each other. • During the cell division, it changes into rod-like structures called "chromosomes".



3 Test yourself

Choose the correct answer :

1. Which of the following is **not** from the nucleus components ?
   - ⓐ Endoplasmic reticulum.
   - ⓑ Nucleolus.
   - ⓒ Chromatin reticulum.
   - ⓓ Nuclear envelope.

2. Which of the following is considered a similarity between the nuclear envelope and the cell wall ?
   - ⓐ The type of polymer that forms each one of them.
   - ⓑ The presence of pores in both of them.
   - ⓒ The direct connection with the cytoplasm.
   - ⓓ Their presence in all cells.

Chromosome



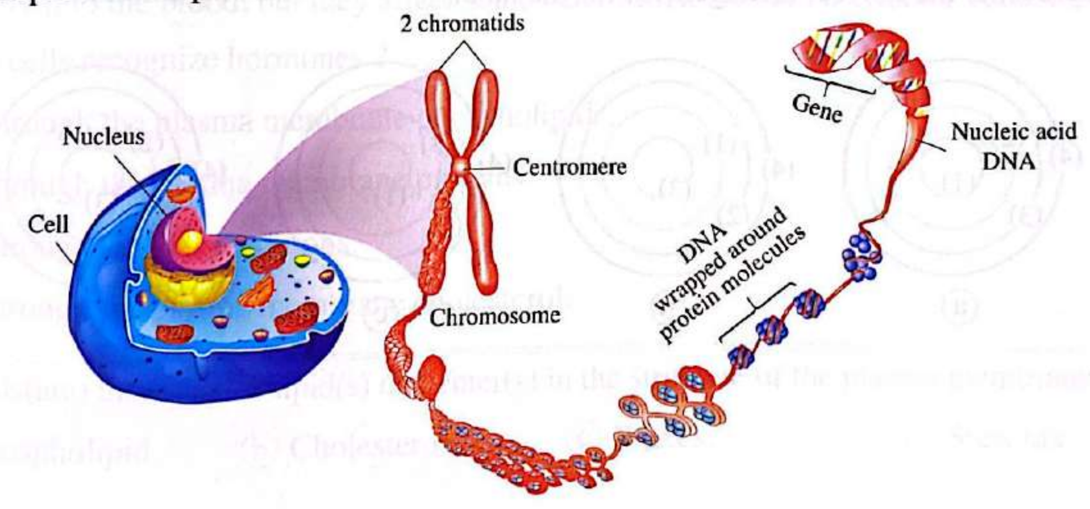
1. During the metaphase of the cell division, the chromosome appears more obvious, which consists of two filaments, each filament is called **chromatid**.
   The two chromatids are joined together at a central part called the **centromere**.

THE ORIGIN OF WORD

Chromosomes were called by this name, because they are stained by basic dyes. So, they appear coloured, making them seen more clearly during the cell division process.

2. Each chromatid is composed of **DNA nucleic acid** that is coiled around the protein molecules which called **histones**.

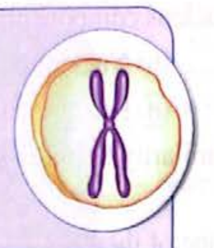
3. **The DNA nucleic acid carries the genetic information (genes) that :**
   - Control the shape and structure of the cell.
   - Organize and regulate the vital activities of the living organism's cells.
   - The genetic traits are transferred through them from a generation to another through the reproduction process.



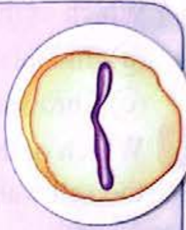
Attention !

- ***Chromosome is not in the form of duplicated chromatids in all phases of cellular division, where the chromosome is :***

Duplicated chromatids at the beginning of mitotic division till the metaphase.



Single chromatid in anaphase and telophase of mitotic division and it is called **"daughter chromosome"**



Before the beginning of a new cell division, the genetic material duplicates in order that each chromosome becomes duplicated chromatids.

- ***In case the cell is not divided, the chromosome will have only one DNA molecule.***
- ***Chromosomes form the chromatin reticulum of the cell nucleus.***



Test yourself



Choose the correct answer :

1 What is the function of the pores that are present in the nuclear membrane ?

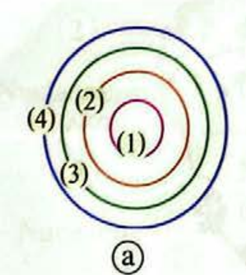
ⓐ Transferring RNA molecules into the cytoplasm to synthesize protein.

ⓑ Transferring DNA molecules into the cytoplasm to synthesize protein.

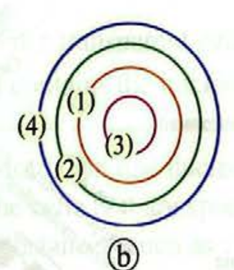
ⓒ Transferring both DNA and RNA molecules into the cytoplasm to synthesize protein.

ⓓ Transferring ribosomes into the nucleus to synthesize protein.

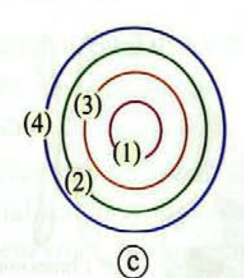
2 If you knew that the labels are : (1) "chromosome", (2) "nucleus", (3) "gene" that all are structures exist inside (4) "living cell", which of the following figures represents the correct arrangement for the labels ?



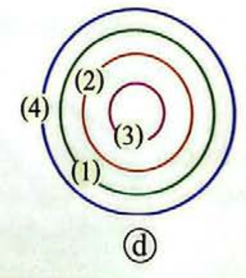
ⓐ



ⓑ



ⓒ



ⓓ

Chapter 2

Questions on Lesson One

Cell Structure





● Understand ● Apply ● Analyze



Interactive test

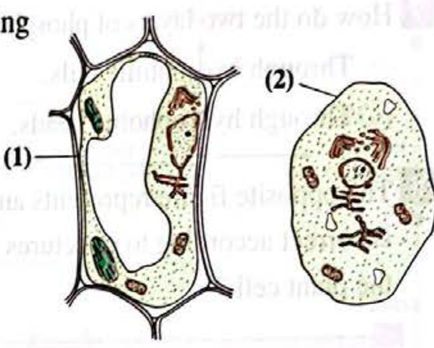
First Multiple Choice Questions

1 Which of the following substances determine(s) the shape of the corn plant cell ?

ⓐ Protein and cellulose. ⓑ Lipids and protein.

ⓒ Lipids only. ⓓ Cellulose only.

2 From the two opposite figures, in which of the following are structures no. (1) and (2) common ?

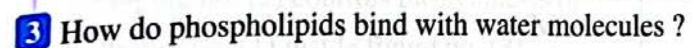


ⓐ The polymer which forms each of them.

ⓑ The separation between the cell contents and the surrounding medium.

ⓒ Controlling the passage of different substances.

ⓓ The liquid nature for each one of them.



3 How do phospholipids bind with water molecules ?

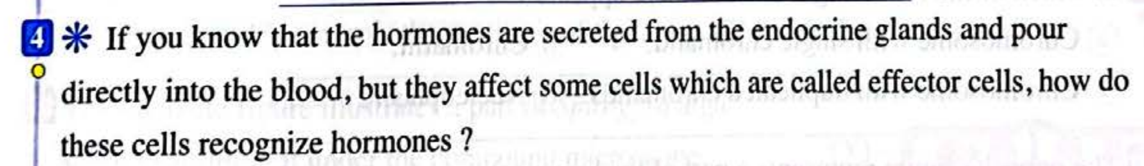
ⓐ Through binding tails to water.

ⓑ Through binding heads to water.

ⓒ Through binding heads and tails to water.

ⓓ Through dissolving phospholipids in water.

4 ✳ If you know that the hormones are secreted from the endocrine glands and pour directly into the blood, but they affect some cells which are called effector cells, how do these cells recognize hormones ?



ⓐ Through the plasma membrane phospholipids.

ⓑ Through the plasma membrane proteins.

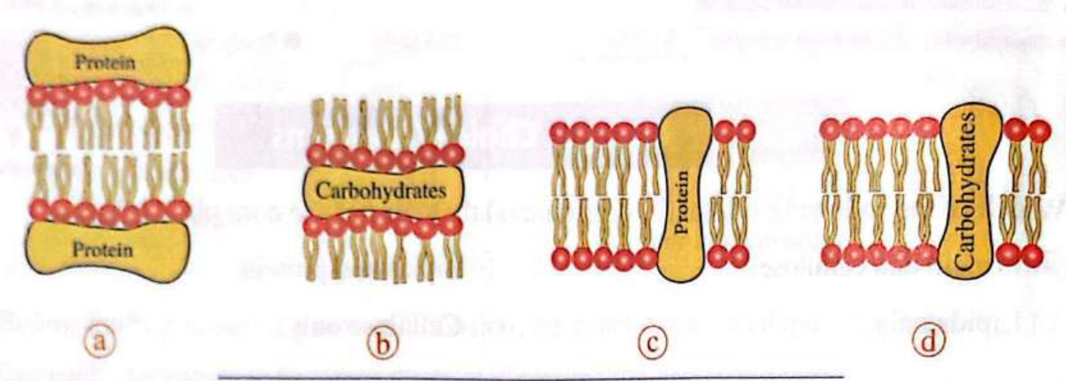
ⓒ Through the cell secretions.

ⓓ Through the plasma membrane cholesterol.

5 What is(are) the complex lipid(s) that enter(s) in the structure of the plasma membrane ?

ⓐ Phospholipid. ⓑ Cholesterol. ⓒ Waxes. ⓓ Steroids.

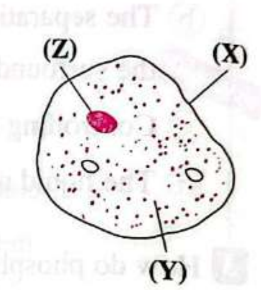
6 Which of the following figures represents a part from the structure of the plasma membrane of the cell ?



7 How do the two layers of phospholipids in the plasma membrane face each other ?

ⓐ Through hydrophilic tails. ⓑ Through hydrophilic heads.
ⓒ Through hydrophobic heads. ⓓ Through hydrophobic tails.

8 The opposite figure represents an animal cell, which of the following is correct according to structures (X), (Y) and (Z) that are found in the plant cell ?



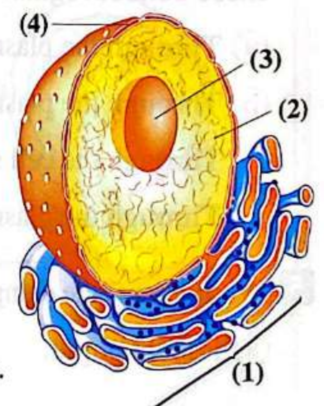
	(X)	(Y)	(Z)
ⓐ	✓	✓	✓
ⓑ	✗	✗	✓
ⓒ	✓	✓	✗
ⓓ	✗	✓	✗

✓	Present
✗	Absent

9 In which of the following the centromere appears ?

ⓐ Chromosome with single chromatid. ⓑ Chromatin.
ⓒ Chromosome with duplicated chromatids. ⓓ Nucleoplasm.

10 The opposite figure represents a part of the living cell structure, study it, then answer :



(1) What is the part that carries genes ?

ⓐ (1). ⓑ (2).
ⓒ (3). ⓓ (4).

(2) What are the components of part no. (2) ?

ⓐ Lipids and DNA ⓑ Proteins and DNA
ⓒ Proteins and RNA ⓓ Lipids and proteins.

(3) Which substances are affected directly on their production, when a disturbance occurs in structure no. (3) ?

ⓐ Proteins. ⓑ Carbohydrates. ⓒ Lipids. ⓓ Mineral salts.

11 ✱ What is the number of DNA molecules in a living organism's cell that contains 10 chromosomes during metaphase of the mitotic division ?

ⓐ 5 ⓑ 10 ⓒ 15 ⓓ 20

12 ✱ Which of the following graphs expresses the relation between the number of nucleoli inside the cells and the secretion of enzymes ?

Enzymes secretion / Number of nucleoli — ⓐ ⓑ ⓒ ⓓ

13 From the opposite three figures, which of the following expresses the relation between them ?

Protein

Figure (1) Figure (2) Figure (3)

ⓐ Figure no. (2) controls the synthesis of figure no. (1) inside figure no. (3).

ⓑ Figure no. (2) controls the synthesis of figure no. (3) inside figure no. (1).

ⓒ Figure no. (1) controls the synthesis of figure no. (3) inside figure no. (2).

ⓓ Figure no. (3) controls the synthesis of figure no. (2) inside figure no. (1).

14 The opposite figure illustrates a part of *Spirogyra* alga when examining it under the compound microscope, study it, then answer :

(Y) (X)

(1) What is the composition of structure (X) ?

ⓐ Carbohydrates. ⓑ Proteins.

ⓒ Lipids. ⓓ Phospholipids.

(2) What is the building unit that enters in the formation of structure (X) ?

ⓐ Glucose. ⓑ Amino acid.

ⓒ Fatty acid. ⓓ Glycerol.

(3) What does structure (Y) refer to ?

ⓐ Green plastid. ⓑ Nucleus.

ⓒ Nucleolus. ⓓ Sap vacuole.

15 The opposite figure represents a part of the living cell structure, study it, then answer :

(1) ✱ Which of the following parts has a role in the selective permeability of certain substances to enter the cell ?

ⓐ (1). ⓑ (2).

ⓒ (3). ⓓ (4).

(2) The previous figure consists of .... compounds.

ⓐ homogenous

ⓑ heterogenous

ⓒ homogenous and heterogenous

ⓓ identical

16 Which of the following choices represents the structure of plasma membrane of the plant cell ?

	Carbohydrates	Proteins	Simple lipids	Complex lipids	Lipid derivatives
ⓐ	✓	✓	✗	✓	✓
ⓑ	✗	✓	✓	✗	✓
ⓒ	✓	✓	✓	✓	✗
ⓓ	✗	✗	✓	✓	✗

✓	Present
✗	Absent

17 How do the two layers of phospholipids in the cell membrane are attached to the fluid that is present inside and outside the cell ?

ⓐ Through hydrophilic heads and hydrophobic tails respectively.

ⓑ Through hydrophobic tails and hydrophilic heads respectively.

ⓒ Through hydrophilic heads.

ⓓ Through hydrophobic tails.

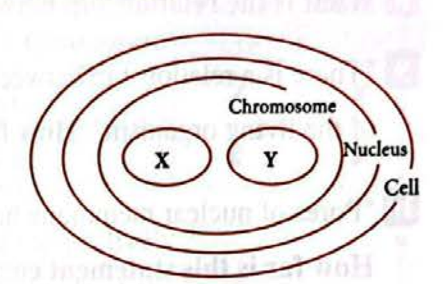


18 ✻ Which of the following choices expresses correctly the effect that appears on the shown substances in the table when the pores of the nuclear membrane dissappear ?

	Carbohydrates	Proteins	Fats	Mineral salts
(a)	✘	✓	✓	✘
(b)	✓	✓	✓	✘
(c)	✓	✓	✓	✓
(d)	✘	✓	✘	✓

✓	Affected
✘	Not affected

19 ✻ The opposite diagram represents a cell of a living organism, what do symbols (X) and (Y) represent ?



(a) ATP and monosaccharides.

(b) Protein and DNA

(c) Nucleotides and ATP

(d) Monosaccharides and phosphate groups.

20 Which of the following its function is greatly affected, if its cells lose some nucleoli ?

(a) Skin epidermis.
(b) Arm muscle.
(c) Yellow bone marrow.
(d) Stomach lining.

Second Miscellaneous Questions

1 **Give reason for :** the dissolved substances in soil solution pass from outside to inside the plant cell easily.

2 **What is the importance of :** complex lipids in the cell membrane ?

3 **What is the importance of :** lipid derivative in the cell membrane ?

4 **What happens if :** the plant cell doesn't contain the plasma membrane ?

5 **What happens in case of :** the absence of protein molecules from the plasma membrane ?

6 **What happens if :**

- Phospholipid molecules aren't linked with the cholesterol substance in the cell membrane ?
- The cholesterol substance is absent from the cell membrane ?

7 **The opposite diagrammatic figure illustrates a plant cell, deduce the number and the name of the structure that indicates each of the following statements :**

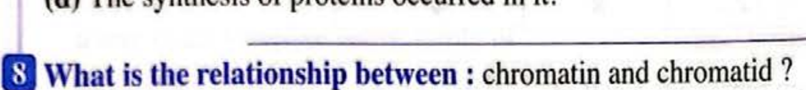
(a) It consists of complex sugar.

(b) Lipids and proteins enter in its structure.

(c) It contains the genetic information required to form the protein.

(d) The synthesis of proteins occurred in it.

(1) (2) (3) (4) (5)



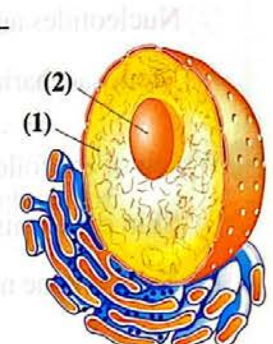
8 **What is the relationship between :** chromatin and chromatid ?

9 "There is a relationship between the nucleus and the appearance of genetic traits of the living organism". **How far is this statement correct ? With explanation.**

10 "Pores of nuclear membrane has an indirect role in the protein synthesis".

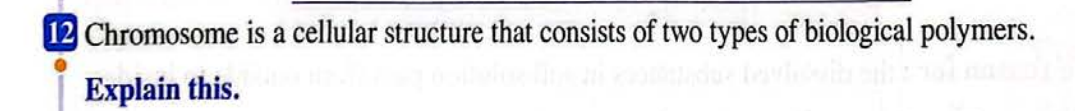
How far is this statement correct ? With explanation.

11 **From the opposite figure :**



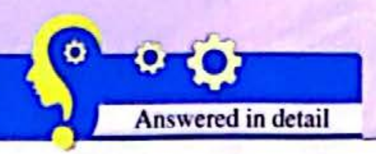
(a) **What is the relationship between** structure no. (1) and maintaining the shape and structure of the cell ?

(b) **What is the relationship between** the numbers of structure no. (2) and the synthesis of some hormones ?



12 Chromosome is a cellular structure that consists of two types of biological polymers. **Explain this.**

Questions that measure **high levels of thinking**



Choose the correct answer :

1 Which of the following protect(s) the plant cell from losing its vital properties ?

ⓐ Glucose.
ⓑ Phospholipids.
ⓒ Cellulose.
ⓓ Chromatin.

---

2 The opposite table illustrates two organic compounds (X) and (Y), where each one of them consists of saturated fatty acids and glycerol, but they differ in the physical state,

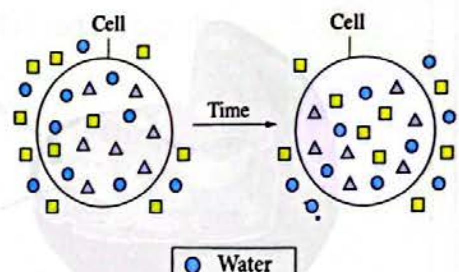
Physical state / Compound	Liquid state	Solid state
(X)	✓	✗
(Y)	✗	✓

which of the following represents compounds (X) and (Y) respectively ?

ⓐ Oils / Fats.
ⓑ Phospholipids / Fats.
ⓒ Oils / Phospholipids.
ⓓ Cholesterol / Phospholipids.

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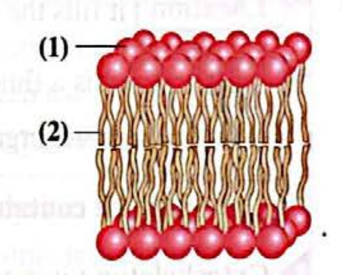
3 From the opposite figure, what is the reason for obstructing the movement of the protein molecules from inside to outside the cell ?



ⓐ Temperature.
ⓑ pH value.
ⓒ Size of molecules.
ⓓ Concentration of molecules.

Answer the following questions :

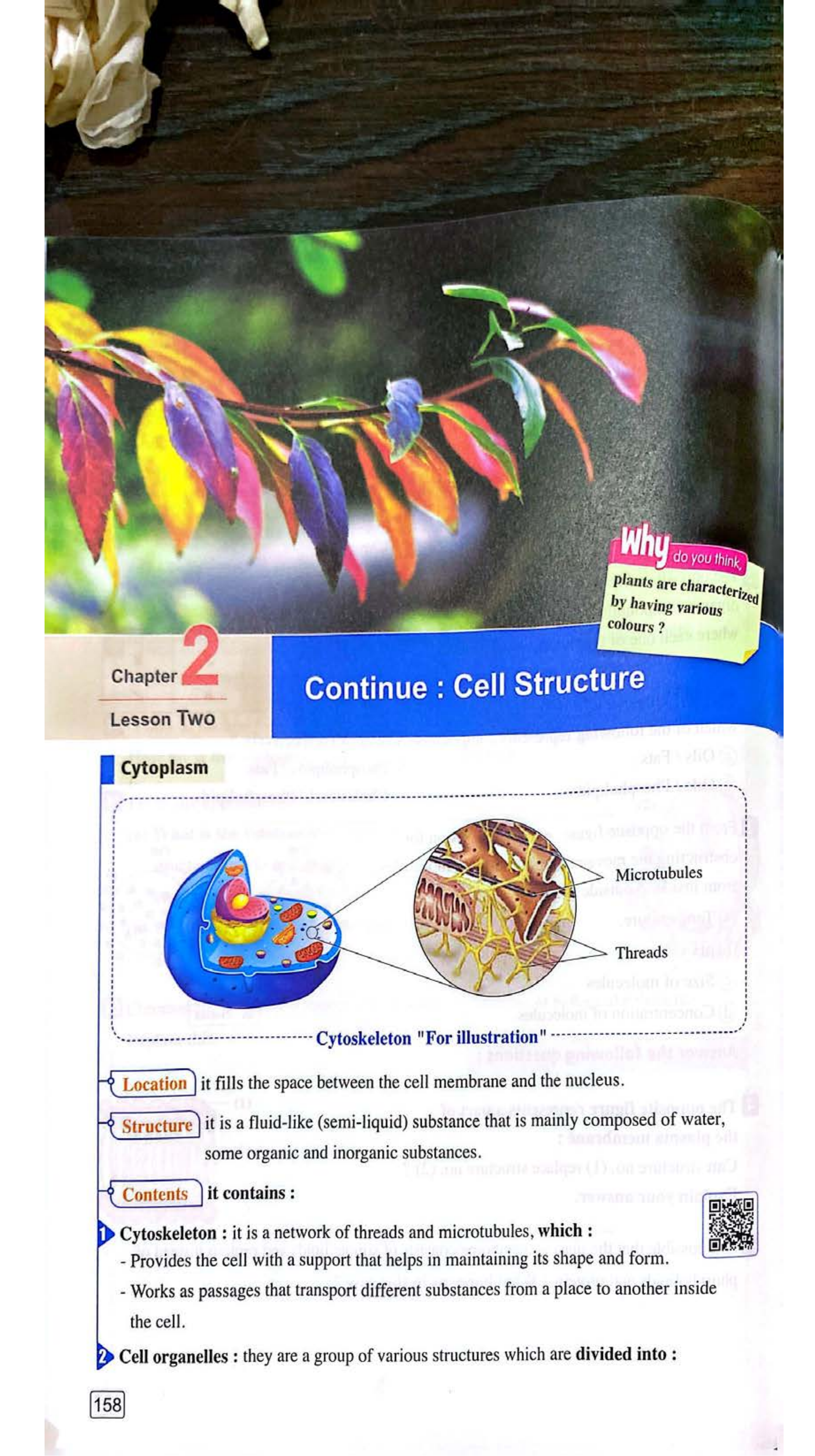
4 **The opposite figure represents a part of the plasma membrane :**



Can structure no. (1) replace structure no. (2) ?
Explain your answer.

---

5 Is it possible that the plasma membrane consists of simple lipids and protein instead of phospholipids and protein ? **What happens in this case ?**



Chapter 2

Lesson Two

Continue : Cell Structure

Cytoplasm

Cytoskeleton "For illustration"

Location it fills the space between the cell membrane and the nucleus.

Structure it is a fluid-like (semi-liquid) substance that is mainly composed of water, some organic and inorganic substances.

Contents **it contains :**

1. **Cytoskeleton :** it is a network of threads and microtubules, **which :**
   - Provides the cell with a support that helps in maintaining its shape and form.
   - Works as passages that transport different substances from a place to another inside the cell.
2. **Cell organelles :** they are a group of various structures which are **divided into :**

Non-membranous organelles	Membranous organelles
• They are not surrounded by a membrane.	• They are surrounded by a membrane.
Examples	
- Ribosomes. - Centrosome.	- Endoplasmic reticulum. - Golgi bodies. - Lysosomes. - Mitochondria. - Vacuoles. - Plastids.

1 Test yourself



Choose the correct answer :

1 Which of the following **doesn't/don't** contain membranes ?

ⓐ Nucleus. ⓑ Cytoplasm microtubules.

ⓒ Golgi bodies. ⓓ Mitochondria.

2 Which of the following keep(s) the shape and form of the plant cell ?

ⓐ Cell wall only. ⓑ Cell membrane only.

ⓒ Microtubules in the cytoplasm only. ⓓ (a) and (c) together.

A Non-membranous organelles

1 Ribosomes

Description they are non-membranous round-shaped organelles.

Location

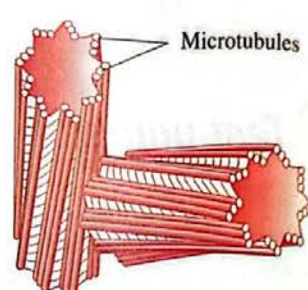
❶ Some of them are free in the cytoplasm (single or in clusters) "The least number".	To produce and release protein directly into the cytoplasm, so that the cell uses it in its vital processes, such as growth, regeneration and others.
❷ Others are attached to the outer surface of the endoplasmic reticulum "The largest number".	To produce proteins (as enzymes) that are transported by the endoplasmic reticulum to outside the cell after making some modifications to them in the Golgi body.

Function they are responsible for synthesizing protein in the cell.

2 Centrosome

Location

- It is located in animal cells (except the nerve cells) and some fungal cells near the nucleus.
- It is not present in the cells of the plants, algae and most fungi, whereas these cells contain a region of cytoplasm instead of the centrosome which performs the same function.



Two centrioles

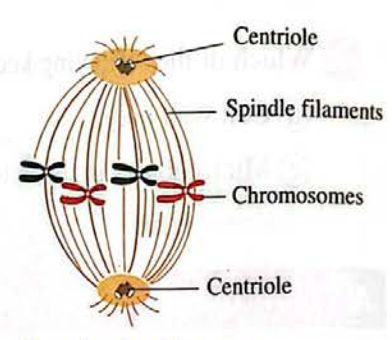
Structure

- It consists of two tiny particles called **"centrioles or centrosome"**.
- Each centriole consists of 9 groups of microtubules that are arranged in triplets in a cylindrical shape (i.e. it is composed of 27 microtubules).

Functions

It plays an important role :

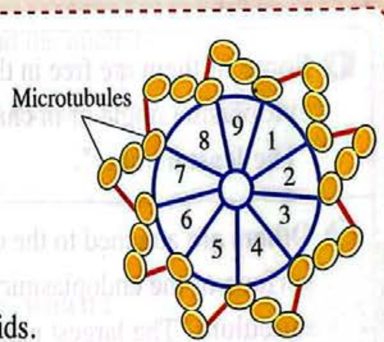
1. During the cell division, where the spindle filaments extend between the two centrioles that are present at each pole of the cell. So, these centrioles withdraw the chromosomes towards the cell poles in order to help in the cell division into two cells.
2. In the formation of flagella and cilia (movement tools in some unicellular organisms).



The role of centrosome during the cell division "For illustration only"

Key Points

- Ribosome and centrosome are non-membranous organelles, therefore they are the least affected by lipids solvents.
- Spindle filaments are proteins that have the ability to shrink allowing the chromosomes attraction towards the cell poles during the cell division.
- **Centromere :** the point of connection of the **two** chromatids.
- **Centrosome :** it consists of the **two** centrioles.
- During the cellular division, the centrosome duplicates to give **4** centrioles, each centriole directs to one of the cell poles to make the spindle filaments extend from it.





Test yourself



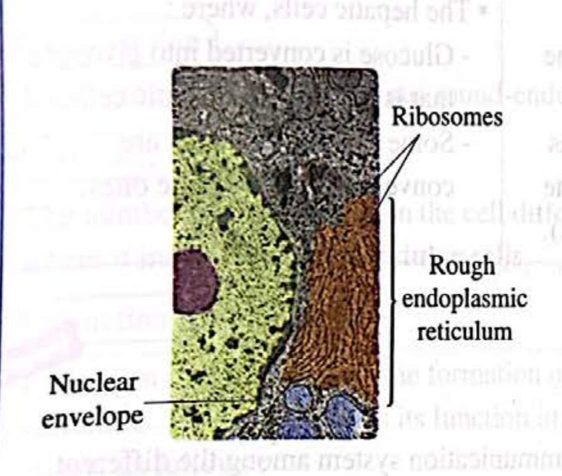
What is the number of microtubules from which the centrosome is composed, in three nerve cells in human ?

____

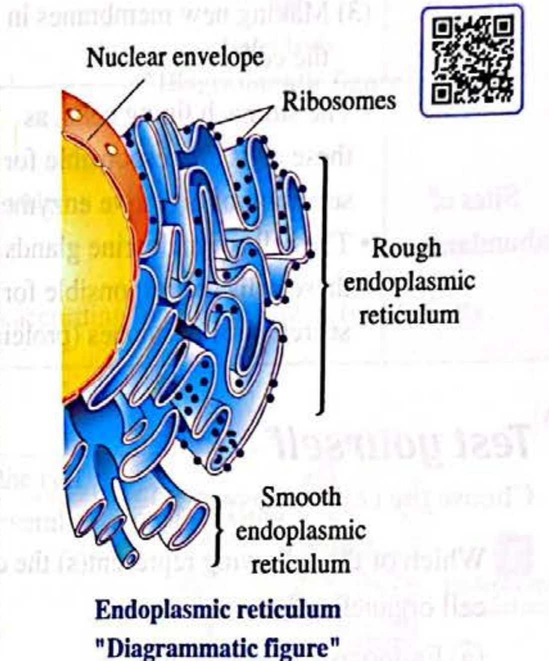
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B Membranous organelles

1 Endoplasmic reticulum



Endoplasmic reticulum "Under transmission electron microscope"



Endoplasmic reticulum "Diagrammatic figure"

Description

It is a network of membranous canaliculi.

Location

It extends through all the parts of the cytoplasm and attaches to the nuclear envelope and cell membrane.

Functions

1. It forms an internal transport system that benefits in transferring substances from a part to another inside the cell.
2. It transfers substances between the nucleus and cytoplasm.

Types

There are two types of endoplasmic reticulum, **which are :**

P.O.C.	① Rough endoplasmic reticulum	② Smooth endoplasmic reticulum
The presence of ribosomes :	It is characterized by the presence of a large number of ribosomes on its surfaces.	Ribosomes are absent from it.
Functions :	(1) Synthesizing proteins in the cell. (2) Making modifications on proteins that are produced (secreted) by ribosomes. (3) Making new membranes in the cell.	(1) Synthesizing lipids in the cell. (2) Transforming glucose into glycogen. (3) Modifying the nature of some toxic chemicals to reduce their toxicity (harmful effects).
Sites of abundance :	• The stomach lining cells, as these cells are responsible for the secretion of digestive enzymes. • The cells of endocrine glands, as these cells are responsible for the secretion of hormones (proteins).	• The hepatic cells, where : - Glucose is converted into glycogen that is stored in the hepatic cells. - Some toxic compounds are converted into less toxic ones.

③ Test yourself



Choose the correct answer :

1 Which of the following represent(s) the communication system among the different cell organelles ?

ⓐ Endoplasmic reticulum.

ⓑ Nerve cells.

ⓒ Ribosomes.

ⓓ Centrosome.

2 Which of the following organelles is(are) present abundantly in the liver cells of a worker in an insecticides company ?

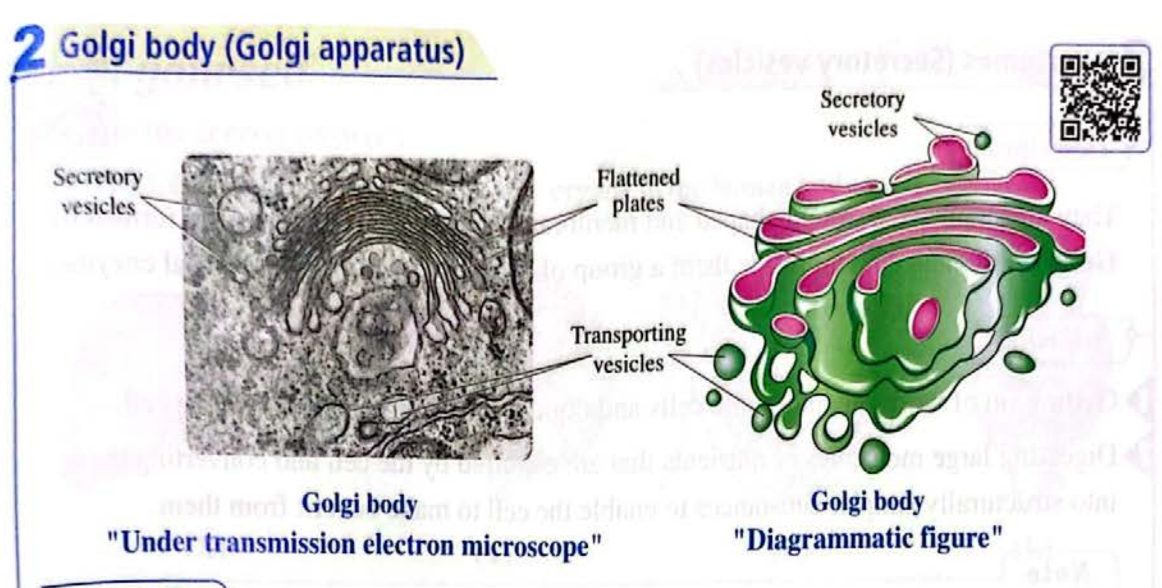
ⓐ Ribosomes.

ⓑ Rough endoplasmic reticulum.

ⓒ Smooth endoplasmic reticulum.

ⓓ Golgi bodies.

2 Golgi body (Golgi apparatus)



Golgi body "Under transmission electron microscope"

Golgi body "Diagrammatic figure"

Description

It is a group of flat membranous round-ended sacs.

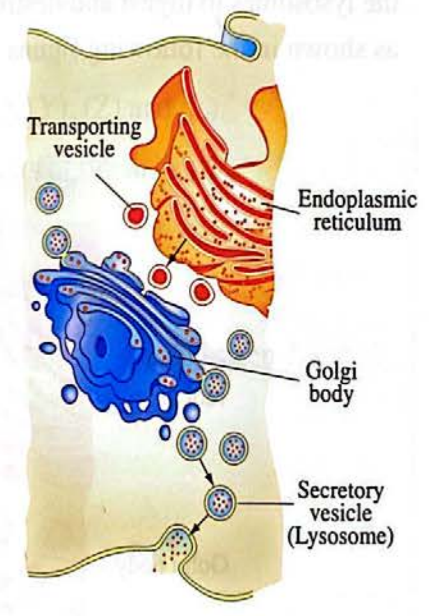
Number

The number of Golgi bodies in the cell differs according to the cell's secretion activity, where it increases in the **glandular cells.**

Function

It plays an important role in the formation of the cell secretions, where it performs its function in several stages, **as follows :**

1. It receives the molecules that are secreted by the endoplasmic reticulum through a group of transporting vesicles.
2. It classifies and modifies these molecules of substances.
3. It distributes these substances to the places where they are used inside the cell or it may pack them inside secretory vesicles called "lysosomes" that move towards the cell membrane, where the cell expels them outside as secretory products.



The role of Golgi body in the formation of secretory vesicles

THE ORIGIN OF WORD

- **Golgi apparatus** it was named after the Italian anatomist and pathologist Camillo Golgi who described it for the first time in 1898.
- It is also known as **Golgi complex**, and also known as dictyosomes in plants and algae.

3 Lysosomes (Secretory vesicles)

Description

They are small-sized, round-shaped and membranous vesicles, where they are formed by **Golgi bodies** and contain inside them a group of **digestive enzymes** (lysosomal enzymes).

Functions

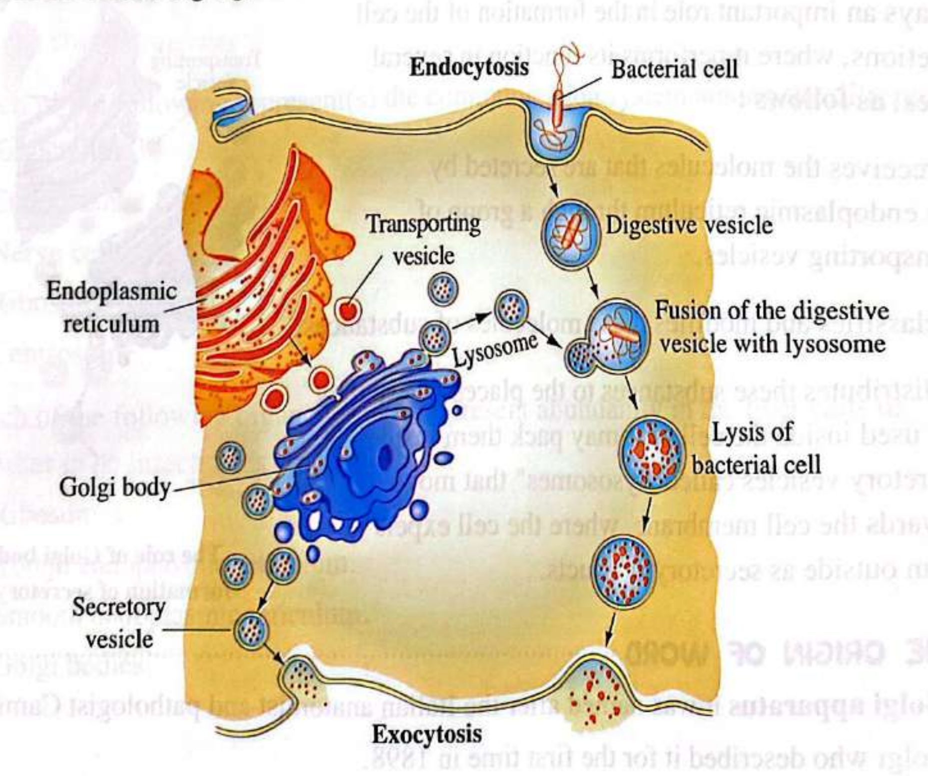
1. Getting rid of worn-out and senile cells and organelles which are useless to the cell.
2. Digesting large molecules of nutrients that are engulfed by the cell and converting them into structurally simpler substances to enable the cell to make benefit from them.

Note

The cell is not affected by the enzymes of lysosomes, because these enzymes are surrounded by a membrane that isolates them from the cell components.

• Example :

White blood cells (corpuscles) use the digestive enzymes that are present inside the lysosomes to digest and destroy pathogens (as microbes) which invade the cell, as shown in the following figure :



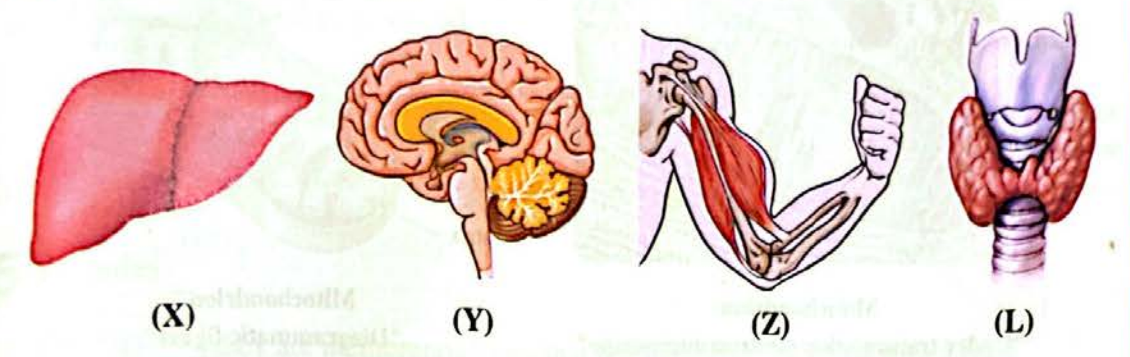
Role of lysosomes in digesting pathogens inside a white blood cell

4 Test yourself



Choose the correct answer :

1 The following figures illustrate some organs in the human body :



(1) In which of the following organs' cells the smooth endoplasmic reticulum is present abundantly ?

ⓐ (X) and (Z).
ⓑ (X) and (Y).
ⓒ (Z) and (L).
ⓓ (Y) and (Z).

(2) Which of the following organs whose cells contain Golgi apparatus ?

ⓐ (X).
ⓑ (Y) and (Z).
ⓒ (Y), (Z) and (L).
ⓓ (X), (Y), (Z) and (L).

(3) Which of the following is(are) absent from most cells of organ (Y) ?

ⓐ Centrosome.
ⓑ Ribosomes.
ⓒ Endoplasmic reticulum.
ⓓ Mitochondria.

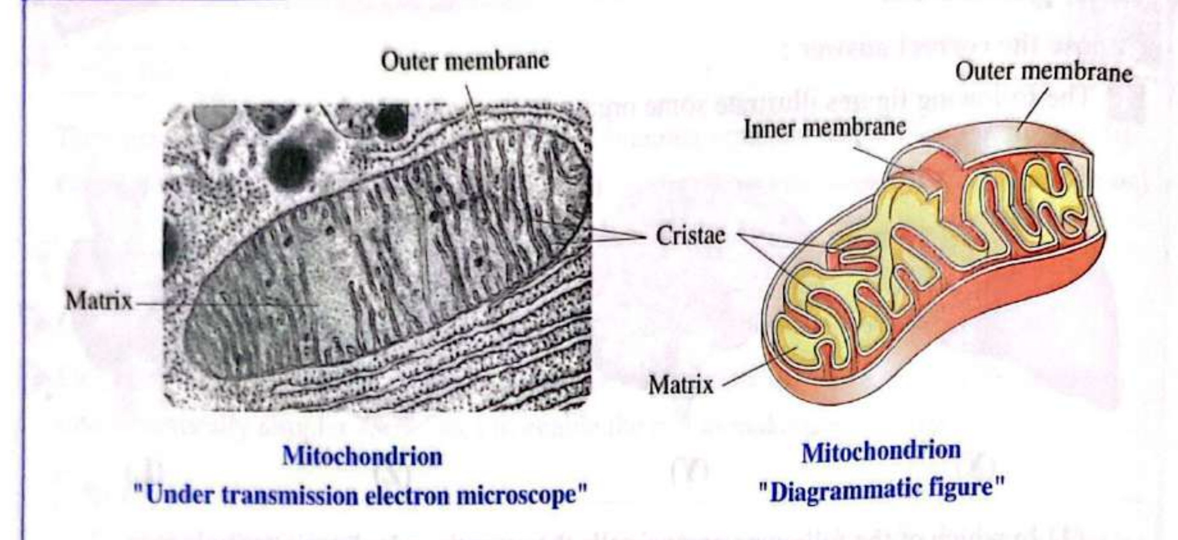
2 Which of the following stages precedes directly the exocytosis of a pathogen ?

ⓐ Endocytosis.
ⓑ Lysis of pathogen by the digestive enzymes.
ⓒ The secretion of secretory vesicles from Golgi body.
ⓓ Fusing the digestive vesicles with lysosome.

3 If you know that the mucous substance that is secreted in the respiratory cavities as trachea is a protein substance in addition to carbohydrate substances, which of the following organelles is(are) responsible for this addition ?

ⓐ Ribosomes.
ⓑ Centrosome.
ⓒ Lysosomes.
ⓓ Golgi body.

4 Mitochondria



Mitochondrion "Under transmission electron microscope"

Mitochondrion "Diagrammatic figure"

Description they are sac-like membranous organelles.

Structure

- Their wall consists of two membranes (outer and inner).
- A group of folds known as "cristae" are extended from the inner membrane into its matrix.

Functions

1. They are considered the main storehouse for the respiratory enzymes in the cell.
2. They are the storehouse for the substances that are necessary to store the energy resulted from the cellular respiration, as a result of nutrients oxidation (especially glucose), where this energy is stored in the form of ATP compounds (adenosine triphosphate) and the cell can extract this energy from these ATP compounds once more.

   So, the mitochondria represent the centres of the energy production in the cell **(the energy storehouse in the cell).**

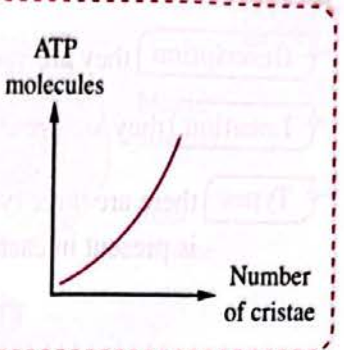
Notes

(1) The function of cristae : they work on increasing the inner membrane surface area on which the chemical reactions that produce energy take place.

(2) The number of mitochondria increases in muscular cells to increase the production of energy needed by the muscles.

Key Points

There is a direct relationship between the number of cristae inside the mitochondria and the amount of produced ATP molecules, the more number of cristae inside the mitochondria, the more amount of energy produced.



5 Vacuoles

Description they are membranous sacs that resemble bubbles filled with a fluid.

Location

- In animal cells, they are small in size and large in number.
- In plant cells, they are gathered in one big vacuole or more called "sap vacuole".

Function - Storing water and nutrients.

Or

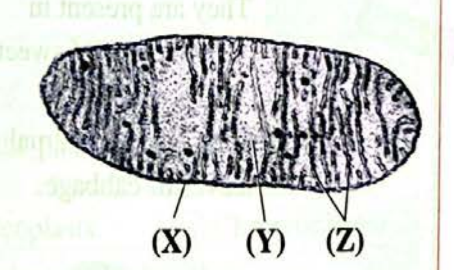
- Storing wastes of the cell, until it gets rid of such wastes.

5 Test yourself



1 Choose the correct answer :

(1) The opposite figure represents one of the organelles that is present abundantly in the muscle cells, through which of the following parts the largest amount of ATP molecules are produced ?



ⓐ (X) only. ⓑ (Z) only. ⓒ (X) and (Y). ⓓ (Y) and (Z).

(2) Which of the following organelles occupies the largest space in a cell of the bean plant root ?

ⓐ Nucleus. ⓑ Dictyosome. ⓒ Sap vacuole. ⓓ Mitochondrion.

3 Give reason : Mitochondria are affected by the fats' solvents ?

6 Plastids

Description they are various shaped membranous organelles.

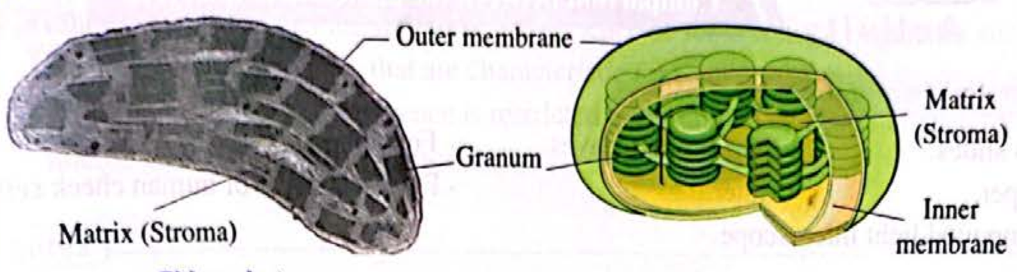
Location they are present in plant cells only.

Types there are three types of plastids that differ depending on the type of pigment that is present in each type of them, which are :

	1 Leucoplasts (White or colourless plastids)	2 Chromoplasts (Coloured plastids)	3 Chloroplasts (Green plastids)
Type of pigments	They don't contain any type of pigments.	They contain carotenoid pigments whose colours are varied between red, yellow and orange.	They contain the green chlorophyll pigment.
Function	They work as centres for storing starch.	They give the plant or its parts a characteristic colour.	Photosynthesis occurs in them, where chlorophyll pigment transforms the light energy of the Sun into chemical energy that is stored in the chemical bonds of glucose.
Location	They are present in the root cells of sweet potatoes, tubers of potatoes and internal leaves of cabbage.	They are present in the roots of some plants such as rapeseed, also found extensively in the petals of flowers and fruits like tomatoes.	They are present in the leaves and stems of green plants.

Structure of the chloroplast





Chloroplast "Under transmission electron microscope"

Chloroplast "Diagrammatic figure"

It is composed of

1. A double envelope (membrane) which consists of outer and inner membranes.
2. An internal matrix called stroma.
3. Compact layers of disk-shaped structures known as thylakoids, where each group of them forms what is known as granum which is found inside the stroma.

Notes

- **Carotenoids (Carotenes) :** they are coloured pigments whose colours are varied between red, yellow and orange, where they are found in the chromoplasts of the plant cells.
- **Chromatin :** it is minute tangled filaments that are coiled around each other and found in the nucleus of animal and plant cells.

For illustration only

The colours of plant cell are related to the presence of chromoplasts as in the petals of flowers or to the presence of some coloured pigments in the cytoplasm as in beet and roselle.

6 Test yourself



1 Choose the correct answer :

(1) Which of the following organelles are used by the plant cell to extract the stored energy in food ?

ⓐ Mitochondria. ⓑ Chloroplasts. ⓒ Leucoplasts. ⓓ Chromoplasts.

(2) Study the opposite table, then determine which of the following choices is correct ?

Structure	Plants	Fungi	Animals
X	✓	✓	✓
Y	✓	✗	✗
K	✗	✗	✓
L	✗	✗	✓

✓	Present
✗	Absent

ⓐ (X) represents the cell wall.
ⓑ (Y) represents the chloroplasts.
ⓒ (K) represents Golgi body.
ⓓ (L) represents sap vacuoles.

2 How is : the food inside leaves of green plants manufactured ?



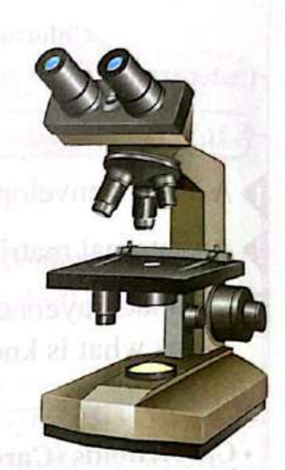
Practical Activity 7 — Comparison between the plant and animal cells



1. Used materials and tools :

- Glass slides.
- *Elodea* plant leaves.
- Forceps.
- Dropper.
- Water.
- Prepared slides of human cheek cells.
- A compound light microscope.

2. Procedure :



1. Use the forceps to separate a recent grown leaf from the tip of *Elodea* plant and put it on a drop of water that is placed on a glass slide, then cover it with a coverslip.
2. Examine the leaf specimen by the low power lens of the light microscope (4x), then by the medium power lens (10x).
3. Sketch some cells that you have observed and name the cellular structures they contain.
4. Examine the specimen by the high power objective lens (40x) and name the structures that you have observed, then sketch these structures on the previously sketched cells.
5. Repeat the steps (2, 3 & 4) with the prepared slides of human cheek cells.

3. Diagrammatic sketch and observations :

	Plant cell (Cell of *Elodea* plant)	Animal cell (Cell of human cheek)
Diagrammatic sketch :	Cell wall, Cytoplasm, Sap vacuole, Chloroplasts, Nucleus	Nucleus, Cell membrane, Vacuole, Cytoplasm
Components that have been observed by microscope :	• Cell wall. • Chloroplasts. • Big sap vacuole. • Cytoplasm. • Nucleus.	• Cell membrane. • Cytoplasm. • Small sap vacuoles. • Nucleus.
Common structures :	• Cytoplasm – Vacuoles – Nucleus.	

4. Conclusion :

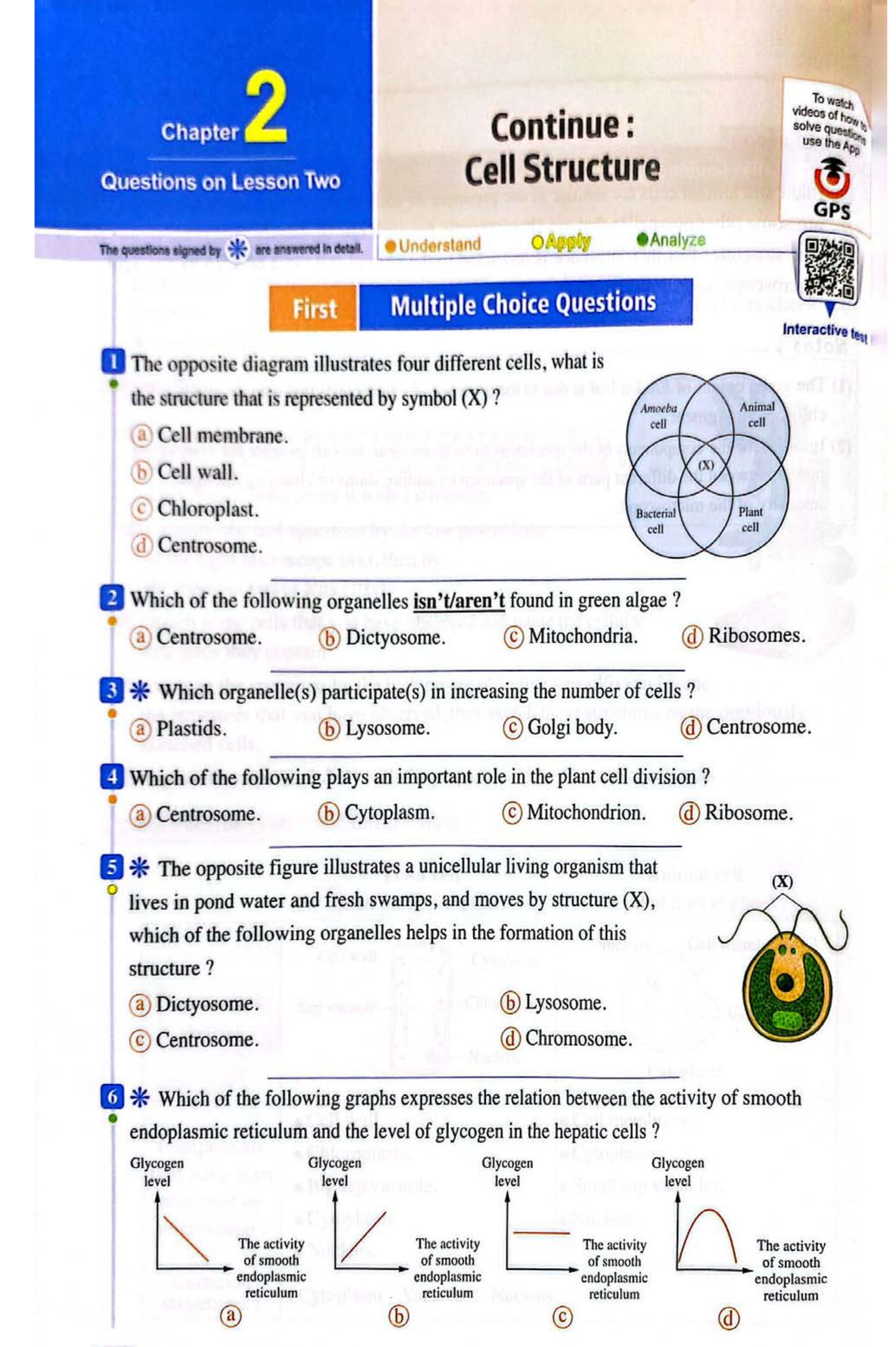
1 Plant and animal cells are similar in the presence of some cellular organelles and there are some other organelles that are characteristic for each one of them.

2 The structures that their presence is restricted to the animal cell can't be seen by the light microscope, such as centrosome.

Notes

(1) The green colour of *Elodea* leaf is due to the presence of chloroplasts that contain green chlorophyll pigment.

(2) In order for the components of the specimens to be more clear, we can increase the contrasting power between the different parts of the specimen by adding stains or changing the light intensity of the microscope.



Chapter 2

Questions on Lesson Two

Continue : Cell Structure

To watch videos of how to solve questions use the App GPS

The questions signed by ✻ are answered in detail.

● Understand ○ Apply ● Analyze

Interactive test

First Multiple Choice Questions

1 The opposite diagram illustrates four different cells, what is the structure that is represented by symbol (X) ?

ⓐ Cell membrane.
ⓑ Cell wall.
ⓒ Chloroplast.
ⓓ Centrosome.

2 Which of the following organelles **isn't/aren't** found in green algae ?

ⓐ Centrosome. ⓑ Dictyosome. ⓒ Mitochondria. ⓓ Ribosomes.

3 ✻ Which organelle(s) participate(s) in increasing the number of cells ?

ⓐ Plastids. ⓑ Lysosome. ⓒ Golgi body. ⓓ Centrosome.

4 Which of the following plays an important role in the plant cell division ?

ⓐ Centrosome. ⓑ Cytoplasm. ⓒ Mitochondrion. ⓓ Ribosome.

5 ✻ The opposite figure illustrates a unicellular living organism that lives in pond water and fresh swamps, and moves by structure (X), which of the following organelles helps in the formation of this structure ?

ⓐ Dictyosome. ⓑ Lysosome.
ⓒ Centrosome. ⓓ Chromosome.

6 ✻ Which of the following graphs expresses the relation between the activity of smooth endoplasmic reticulum and the level of glycogen in the hepatic cells ?

7 Which of the following **<u>isn't/aren't</u>** synthesized by the endoplasmic reticulum ?

ⓐ Glycogen. ⓑ Lipids. ⓒ Proteins. ⓓ DNA

---

8 Which of the following functions in the cell **<u>isn't</u>** affected directly by the absence of endoplasmic reticulum ?

ⓐ The formation of cell secretions. ⓑ Protein synthesis.

ⓒ Energy production. ⓓ The connection between the cell parts.

---

9 The different substances move in certain passages inside the cell, which of the following organelles determine(s) these passages ?

ⓐ Golgi bodies. ⓑ Endoplasmic reticulum.

ⓒ Mitochondria. ⓓ Lysosomes.

---

10 In which of the following organs' cells where the smooth endoplasmic reticulum is present abundantly ?

ⓐ Liver and muscles. ⓑ Stomach and liver.

ⓒ Stomach and muscles. ⓓ Brain and muscles.

---

11 The opposite figure illustrates an animal cell, in which of the following cellular structures the synthesis of materials used as enzymes takes place ?

(X)
(Y)
(Z)
(L)

ⓐ (X)

ⓑ (Y)

ⓒ (Z)

ⓓ (L)

---

12 By using the following figure that represents a part of a living cell, answer :

Nuclear envelope
(1)
(2)

(1) Which of the following is from the functions of part no. (1) ?

ⓐ Synthesis of protein in the cell.

ⓑ Energy production in the cell.

ⓒ Synthesis of lipids in the cell.

ⓓ Transferring the genetic traits.

(2) Which of the following is from the functions of part no. (2) ?

ⓐ Synthesis of protein in the cell.

ⓑ Energy production in the cell.

ⓒ Synthesis of lipids in the cell.

ⓓ Transferring the genetic traits.

13 The largest amount of ribosomes is found in the cells that produce ....

ⓐ lipids. ⓑ carbohydrates. ⓒ glycogen. ⓓ proteins.

14 Which of the following are found in both a white blood cell and a cell from a corn plant leaf ?

ⓐ Nucleus and cytoplasm.
ⓑ Plasma membrane and large vacuole.
ⓒ Nucleus and plastid.
ⓓ Plasma membrane and centrosome.

15 How far are these statements "all the living cells are similar in the presence of protoplasm", "but they differ in the type and number of the organelles that they contain" correct ?

ⓐ The two statements are correct.
ⓑ The first statement is correct and the second statement is wrong.
ⓒ The first statement is wrong and the second statement is correct.
ⓓ The two statements are wrong.

16 Which of the following graphs represents the relation between the surface area of the inner membrane of the mitochondria (X) and the number of the produced ATP molecules (Y) ?

ⓐ ⓑ ⓒ ⓓ

17 Which of the following where the ribosomes found in the cytoplasm **don't** participate in it ?

ⓐ The compensation of worn out tissues.
ⓑ The formation of muscles.
ⓒ Getting rid of microbes.
ⓓ The formation of cell membrane.

18 Which of the following contain(s) lytic enzymes ?

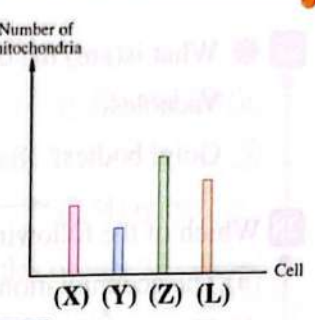
ⓐ Ribosomes. ⓑ Lysosomes. ⓒ Mitochondria. ⓓ centrosome.

19 Inside the living cell, the damaged mitochondrion is surrounded by a membrane forming a vesicle, which of the following do you expect to happen after adhering the lysosome with this vesicle directly ?

ⓐ The rate of ATP molecules production from mitochondrion increases.
ⓑ The lysosomal enzymes repair the damaged mitochondrion.
ⓒ The digestive enzymes decompose the damaged mitochondrion.
ⓓ The damaged mitochondrion is expelled outside the cell.



20 From the opposite graph, which of the following expresses the cell that produces most of ATP molecules ?



ⓐ (X).
ⓑ (Y).
ⓒ (Z).
ⓓ (L).

21 Which of the following **isn't/aren't** from the main components of all the living cells ?

ⓐ Nucleus.
ⓑ Cell wall.
ⓒ Plasma membrane.
ⓓ Ribosomes.

22 "If you know that the changes occurred in the chloroplast is opposite to what happens in the mitochondria", from the previous statement, we can conclude the occurrence of ....

ⓐ catabolism in the plastid.
ⓑ catabolism in the mitochondria.
ⓒ anabolism in the mitochondria.
ⓓ cellular respiration in the plastid.

23 Which of the following is correct about some components of the bread mould fungus ?

	Cell wall	Centrosome	Plastids	Lysosomes
ⓐ	✓	✓	✓	✗
ⓑ	✗	✗	✗	✓
ⓒ	✗	✓	✗	✓
ⓓ	✓	✗	✗	✓

✓	Present
✗	Absent

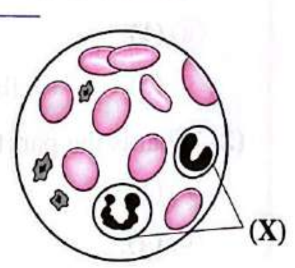
24 Which of the following structures is(are) present in each of the plant and animal cells ?

ⓐ Plastids.
ⓑ Cell wall.
ⓒ Two centrioles.
ⓓ Cytoplasm microtubules.

25 Which of the following parts if it is removed, the cell remains alive, but becomes more vulnerable to pathogens invasion ?

ⓐ Nucleus.
ⓑ Smooth endoplasmic reticulum.
ⓒ Lysosome.
ⓓ Mitochondrion.

26 From the opposite figure that illustrates a human blood sample under the light microscope, which of the following organelles are found abundantly in cells (X) ?



ⓐ Mitochondria.
ⓑ Ribosomes.
ⓒ Lysosomes.
ⓓ Two centrioles.

27 ✻ What is(are) the organelle(s) that found abundantly in the cells of thyroid gland ?

ⓐ Vacuoles. ⓑ Centrosome.

ⓒ Golgi bodies. ⓓ Smooth endoplasmic reticulum.

28 Which of the following **doesn't** occur when Golgi bodies are absent from the cell ?

ⓐ The accumulation of senile organelles in the cell.

ⓑ The stop of transferring substances from a place to another in the cell.

ⓒ The stop of lysosomes production inside the cell.

ⓓ The exposure of the cell to infection with microbes.

29 Which of the following structures **didn't** exist in large amounts in the cells producing enzymes ?

ⓐ Ribosomes. ⓑ Nucleoli. ⓒ Golgi bodies. ⓓ Centrosome.

30 Which of the following organs is dissected by the forensic pathologist to make sure that the death is caused due to ingesting poison ?

ⓐ Stomach. ⓑ Small intestine. ⓒ Liver. ⓓ Spleen.

31 Which of the following **didn't** exist in the lysosomal membranes structure ?

ⓐ Simple lipids. ⓑ Lipid derivatives. ⓒ Complex lipids. ⓓ Proteins.

32 Which of the following is **not** from the green plastids functions in the plant cell ?

ⓐ Performing photosynthesis.

ⓑ Converting energy from one form to another.

ⓒ The oxidation of glucose.

ⓓ Storing energy in the chemical bonds of grapes sugar.

33 Which of the following contain carotene pigment in large amounts ?

ⓐ Mallow (Molukhia) plant leaves. ⓑ Orange fruits.

ⓒ Cabbage leaves. ⓓ Potato tubers.

34 Examine the opposite figure, then answer the following questions :

(1) What is the part where the conversion of energy from one form to another occurs ?

ⓐ (1). ⓑ (2).

ⓒ (5). ⓓ (6).

(2) What is the part that contains DNA ?

ⓐ (1). ⓑ (2).

ⓒ (4). ⓓ (6).

(3) Which of the following parts contain RNA ?

ⓐ (1) and (4). ⓑ (2) and (4). ⓒ (5) and (6). ⓓ (2) and (5).

(4) Which of the following parts characterize(s) the green plants cells ?

ⓐ (1) and (4). ⓑ (2) and (5). ⓒ (5) only. ⓓ (4) only.

(5) What is the part where the oxidation process of glucose molecules occurs ?

ⓐ (2). ⓑ (3). ⓒ (4). ⓓ (5).

---

35 Which of the following represents the correct pathway for the secretion of the pancreatic amylase enzyme ?

ⓐ Golgi body → Transporting vesicles → Rough endoplasmic reticulum → Lysosomes.

ⓑ Transporting vesicles → Golgi body → Rough endoplasmic reticulum → Lysosomes.

ⓒ Rough endoplasmic reticulum → Transporting vesicles → Golgi body → Secretory vesicles.

ⓓ Rough endoplasmic reticulum → Golgi body → Transporting vesicles → Secretory vesicles.

---

36 A student examined four cells (X), (Y), (Z) and (L) by the electron microscope and recorded the examination results in a table, then he represented these results on the opposite graph, study it, then answer :

(1) Which of the following cells may represent cell (X) ?

ⓐ Skin cell.

ⓑ Renal cell.

ⓒ Muscular cell.

ⓓ Small intestine cell.

(2) Which of the following cells may represent cell (Y) ?

ⓐ Skin cell. ⓑ Muscular cell.

ⓒ Cell from thyroid gland. ⓓ Small intestine cell.

(3) Which of the following cells may represent cell (Z) ?

ⓐ Skin cell. ⓑ Hepatic cell.

ⓒ Brain cell. ⓓ Small intestine cell.

(4) Which of the following cells may represent cell (L) ?

ⓐ Red blood cell. ⓑ White blood cell.

ⓒ Muscular cell. ⓓ Skin cell.

37 If you know that a person always suffers from exhausting and fatigue on exerting any physical activity, therefore these symptoms may be a result for a disturbance in the function of which of the following organelles ?

ⓐ Mitochondrion. ⓑ Golgi body.
ⓒ Lysosome. ⓓ Smooth endoplasmic reticulum.

38 From the opposite figure, which of the following parts is used in the production of ATP molecules ?

ⓐ (1).
ⓑ (2).
ⓒ (3).
ⓓ (4).

39 The opposite figure represents mitochondrion, what do the arrows refer to during cellular respiration process ?

ⓐ Oxygen gas.
ⓑ ATP and glucose molecules.
ⓒ Glucose molecules only.
ⓓ ATP molecules only.

40 What is(are) the organelle(s) that is(are) responsible for producing the cholesterol that is needed to build the plasma membranes ?

ⓐ Lysosomes. ⓑ Smooth endoplasmic reticulum.
ⓒ Ribosomes. ⓓ Golgi bodies.

41 What is the source of the digestive enzymes that are secreted from the small intestine ?

ⓐ The ribosomes that exist on the endoplasmic reticulum.
ⓑ The ribosomes that exist in the cytoplasm.
ⓒ The ribosomes that exist on the endoplasmic reticulum and in the cytoplasm.
ⓓ Lysosomes.

42 A cell contains a large amount of rough endoplasmic reticulum, which of the following organelles is(are) expected to exist abundantly in the same cell ?

ⓐ Vacuoles. ⓑ Centrosome.
ⓒ Golgi apparatus. ⓓ Mitochondria.

Second Miscellaneous Questions

1 "Cytoplasm contains the cell organelles only" **How far is this statement correct ? With explanation.**

2 Cytoplasm replaces the function of one of the cell organelles in some living organisms. **Explain this.**

3 **Explain :**
- Ribosomes participate in the growth of the living organisms.
- Ribosomes play an important role in the cell.

4 **What :** are the polymers that their presence is affected directly by the absence of ribosomes from the cell ?

5 "The animal cell loses its ability to divide, in case of the absence of lysosomes". **How far is this statement correct ? With explanation.**

6 **What is the number of :** centrioles that form the centrosome in 10 hepatic cells ?

7 **Compare between :** centrosome **and** centromere, **"in terms of :** location – function".

8 Inside the living cells, some substances are used and get benefits from them. **In the light of your study, answer :**

(a) **What** are the organelles that are responsible for the re-using process ?

(b) **How** are these organelles formed ?

9 "The endoplasmic reticulum participates in the synthesis of lipids in the cell". **How far is this statement correct ? With explanation.**

10 **Give reason for :** the percentage of rough endoplasmic reticulum presence increases in the stomach lining cells and endocrine glands' cells.

11 Liver reduces the sugar level in blood and decreases the toxins in the body. **Explain this.**

12 **Give reason for :** the number of white blood cells increases on the infection of a person with influenza virus.

13 "All hormones are produced from the secretions of the endoplasmic reticulum". **How far is this statement correct ? With explanation.**

14 The muscular cells contain mitochondria more than that in the other types of cells in the animal, **conclude the importance of mitochondria of these muscular cells.**

15 Mention the organelles that are found abundantly in :

(1) Stomach lining cells.
(2) Thyroid gland's cells.
(3) Cells of sweet potato roots.
(4) Potato tubers.
(5) Internal leaves of cabbage.
(6) Petals of purple flowers.
(7) Rapeseed roots.
(8) Mature tomato fruits.
(9) White blood cells.

16 Explain :

(a) There is a relationship between the endoplasmic reticulum and Golgi bodies.
(b) The proportion of Golgi bodies differs in the cells of thyroid gland from that in skin cells.
(c) The number of adenosine triphosphate (ATP) compounds differs in the muscular cell from that in the skin cell.

17 What happens in case of :

(a) The lack of Golgi bodies from the glandular cells.
(b) The lysis of the lysosomes' membranes inside the cell.
(c) The non-separation of lysosomes from Golgi bodies.
(d) The absence of lysosomes from the white blood cells.
(e) The mitochondria are removed from the cell.

18 "Vacuoles are not present in the cells of a plant leaf".
How far is this statement correct ? With explanation.

19 What : is the relation between the starch manufacturing and the chloroplasts ?

20 "Leucoplasts form the glucose sugar".
How far is this statement correct ? With explanation.

21 Write a similarity and a difference between :

(a) Sweet potato root cells and strawberry fruit cells.
(b) A cell of mallow (Molukhia) plant leaf and a cell of rapeseed root.

22 The following table illustrates some structures of two cells (1) and (2) :

The structure	Cell (1)	Cell (2)
Cell wall	Present	Absent
Cell membrane	Present	Present
Chloroplast	Present	Absent
Mitochondria	Present	Present

(a) **Determine** the type of each of the two cells (1) and (2). **With explanation.**
(b) If cell (2) contains a protein attached to iodine, **determine the name of this cell.**

23 **Each of the following cell organelles plays a role in the production of enzymes :**

(Lysosomes – Ribosomes – Golgi bodies – Rough endoplasmic reticulum)

Conclude the correct arrangement of these organelles to produce enzymes.

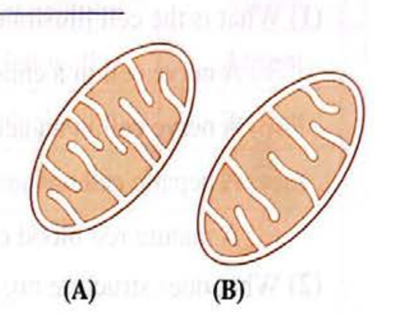
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24 Insulin hormone is a protein that is produced by beta cells in pancreas, **follow by arrows only the pathway of the insulin hormone from its production inside the cells till its arrival to the target cell.**

---

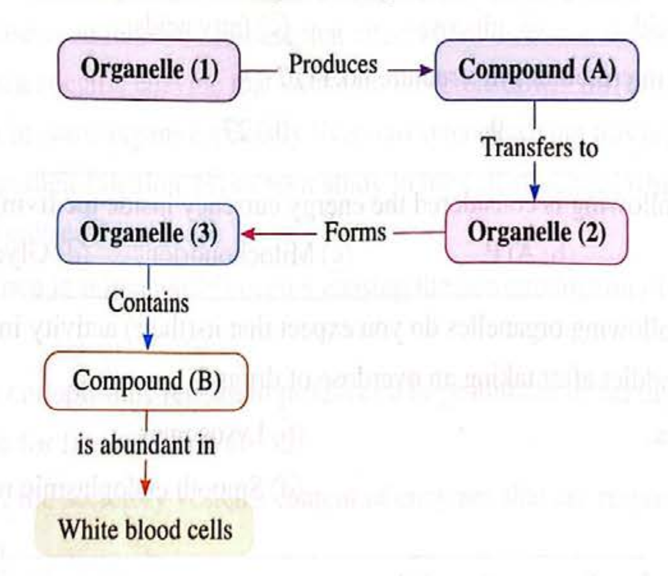
25 **The opposite figures represent two mitochondria :**

In which of (A) or (B) the energy production is greater ? **And why ?**



---

26 **The following diagram illustrates the binding of some organelles with each other to form a number of compounds, study this diagram, then answer :**



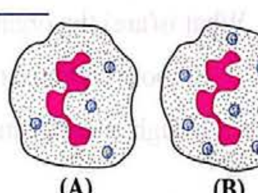
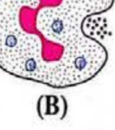
(a) Conclude the name of the organelles from (1) : (3).

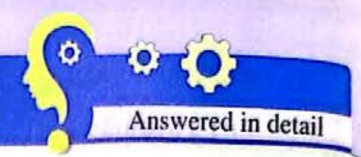
(b) Where are the organelles (1) and (2) present in abundance ?

(c) What do compounds (A) and (B) represent ?

---

27 The opposite figure illustrates two white blood cells (A) and (B).
Which of the two cells may be found in a person suffered from a certain inflammation ? Explain your answer.



Questions that measure **high levels of thinking**

Answered in detail

Choose the correct answer :

1 The following figure illustrates a cell during performing a biological process, study it, then, answer :

Daughter chromosomes

(2)

(1)

(1) What is the cell illustrated in the figure ?

ⓐ A nerve cell in a child brain.
ⓑ A nerve cell in an adult brain.
ⓒ A hepatic cell.
ⓓ A mature red blood cell.

(2) What does structure no. (1) refer to ?

ⓐ Centrosome. ⓑ Centriole. ⓒ Centromere. ⓓ Chromatin.

(3) The movement of structure no. (2) towards the cell poles indicates that it consists mainly of .... units.

ⓐ amino acids ⓑ glucose ⓒ fatty acids ⓓ nucleotides

(4) How many microtubules in structure no. (1) ?

ⓐ 3 ⓑ 9 ⓒ 27 ⓓ 54

---

2 Which of the following is considered the energy currency inside the living cell ?

ⓐ Glucose. ⓑ ATP ⓒ Mitochondrion. ⓓ Glycogen.

---

3 Which of the following organelles do you expect that its(their) activity increases inside the cells of an addict after taking an overdose of drugs ?

ⓐ Golgi bodies. ⓑ Lysosomes.
ⓒ Ribosomes. ⓓ Smooth endoplasmic reticulum.

---

4 Study the following diagram, then deduce :

The conversion of harmful nitrogenous wastes into urea ← Its role in the hepatic cells —



— Its role in the glandular cells → Secretion of steroid hormones

What is(are) the organelle(s) that is(are) represented by symbol (X) ?

ⓐ Smooth endoplasmic reticulum. ⓑ Lysosomes.
ⓒ Rough endoplasmic reticulum. ⓓ Mitochondria.

5 Which of the following organelles has the ability to produce molecules containing nitrogen atoms ?

ⓐ Cell wall.
ⓑ Chromosome.
ⓒ Ribosome.
ⓓ Sap vacuole.

---

6 The opposite table illustrates the sites of DNA in some plant cell structures, depending on the data that are found in the table only, which of the following statements is correct ?

Structure	DNA
Plasma membrane	Absent
Cell wall	Absent
Nucleus	Present
Mitochondria	Present

ⓐ DNA exists in the cytoplasm only.
ⓑ DNA exists inside and outside the nucleus.
ⓒ DNA exists inside the nucleus only.
ⓓ DNA exists only inside the organelles that produce energy.

---

7 Which of the following organelles is(are) less affected when exposed to a lipid solvent ?

ⓐ Mitochondria. ⓑ Ribosome. ⓒ Lysosome. ⓓ Plastids.

---

8 Gaucher disease is an inherited disease that affects human, due to the occurrence of a disturbance in a specific enzyme that works on fats breakdown. So, this leads to fats accumulation in some organs especially liver and spleen causing this organs enlargement and may affect their function. From your study to the cell structure, which of the following causes this disease ?

ⓐ A disturbance in mitochondria occurs causing the non-production of suitable amount of ATP
ⓑ The rough endoplasmic reticulum produces a large amount of the enzymes that are responsible for fats breakdown.
ⓒ The lack of the secretory vesicles content of enzymes that are responsible for fats breakdown.
ⓓ Golgi bodies produce secretory vesicles that fail to perform exocytosis.

---

9 Which of the following are required to exist in large amounts in the cells that contain a large number of mitochondria ?

ⓐ ATP molecules and glucose molecules.
ⓑ ATP molecules and phosphate groups.
ⓒ ADP molecules and phosphate groups.
ⓓ ADP molecules and DNA molecules.

10 The following equation illustrates a vital process occurs in each of the plant and animal, which of the following represents the symbols of the equation ?

$$(X) + (Y) \xrightarrow{(Z)} (L) + CO_2 + \text{Water} + (Z)$$

	(X)	(Y)	(Z)	(L)
ⓐ	O_2	ATP	Enzymes	Glucose
ⓑ	Glucose	O_2	Enzymes	ATP
ⓒ	Enzymes	O_2	ATP	Glucose
ⓓ	Glucose	Enzymes	O_2	ATP

Answer the following questions :

11 **What** is the organelle that has an immunization function inside the cell ?

With explanation.

12 **The following figure illustrates a magnified part for a fungal filament whose fungus lives as a saprophyte, where it gets its food from the lysis of dead organisms through secreting a group of digestive enzymes.**

Study this figure, then answer the following questions :

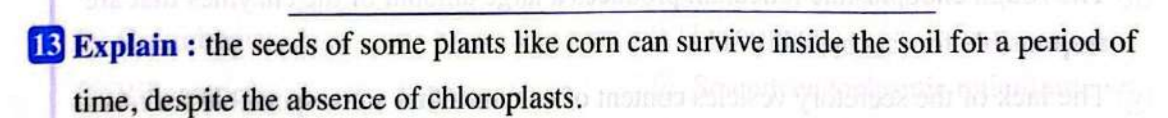
(a) Write down what the labels no. (1), (2) & (3) refer to.

(b) The structures no. (1), (2) and (3) participate in the production and secretion of the digestive enzymes inside the fungal cell. **Follow by arrows only the pathway of these enzymes production, till their exit.**

(1)

(2)

(3)



13 **Explain :** the seeds of some plants like corn can survive inside the soil for a period of time, despite the absence of chloroplasts.

Test on Chapter 2 

Cell Ultrastructure

First — Choose the correct answer (1 : 14)

▸ The opposite figure represents three types of living cells, examine it, then answer :

(A) (B) (C)
Green plastids
• DNA
• Mitochondria
• Plasma membrane
• Cytoplasm
• Ribosomes
Centrosome
Cell wall

1 What does cell (C) represent ?

ⓐ Animal cell. ⓑ Plant cell.

ⓒ Fungal cell. ⓓ Algal cell.

2 Which process of the following <u>can't</u> be performed by cell (A) ?

ⓐ Producing energy. ⓑ Protein synthesis.

ⓒ Performing photosynthesis process. ⓓ Cell division.

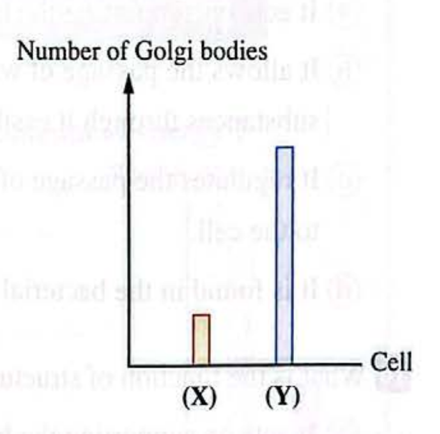
3 Which part of the plant belongs to cell (B) ?

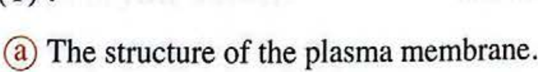
ⓐ Coloured flower petal. ⓑ Sweet potato plant root.

ⓒ Rapeseed plant root. ⓓ Bean plant leaf.

---

4 The opposite graph represents the number of Golgi bodies in two cells (X) and (Y) in human body, what is the difference that may occur between cell (X) and cell (Y) ?




ⓐ The structure of the plasma membrane.

ⓑ The number of nucleoli.

ⓒ The presence of centrosome.

ⓓ The presence of mitochondria.

---

5 If you knew that estrogen hormone is from steroids, what is(are) the organelle(s) that is(are) responsible for synthesizing this hormone ?

ⓐ Mitochondria. ⓑ Smooth endoplasmic reticulum.

ⓒ Rough endoplasmic reticulum. ⓓ Ribosomes.

6 If you knew that the human body contains spleen that is responsible for getting rid of the senescent red blood cells. Which organelle do you expect to be found in abundance inside its cells ?

ⓐ Lysosomes.
ⓑ Smooth endoplasmic reticulum.
ⓒ Mitochondria.
ⓓ Centrosome.

7 In the opposite figure, which of the following structures supplies the cell with a support that maintains its shape ?

ⓐ (1).
ⓑ (2).
ⓒ (3).
ⓓ (4).

8 Which of the following organelles is/are the least affected by non-polar solvents ?

ⓐ Lysosomes.
ⓑ Centrosome.
ⓒ Mitochondria.
ⓓ Golgi bodies.

▸ The following figure represents a bacterial cell that lives in liquid media as water and milk, using the flagella illustrated in the figure for movement, study it, then answer :

9 What is the function of structure (A) ?

ⓐ It acts on supporting the bacterial cell.
ⓑ It allows the passage of water and dissolved substances through it easily.
ⓒ It regulates the passage of substances from and to the cell.
ⓓ It is found in the bacterial and plant cells only.

10 What is the function of structure (B) ?

ⓐ It acts on supporting the bacterial cell.
ⓑ It allows the passage of water and doesn't allow the passage of dissolved substances through it.
ⓒ It regulates the passage of substances from and to the cell.
ⓓ It exists in all the living cells.



11 Which of the following cells contains the largest amount of lysosomes ?

ⓐ Muscular cell. ⓑ Nerve cell.

ⓒ White blood cell. ⓓ Red blood cell.

12 Which of the following organelles occupies the greatest area in the plant cell ?

ⓐ Lysosome. ⓑ Sap vacuole.

ⓒ Golgi body. ⓓ Chloroplast.

13 Which of the following biological macro-molecules leave(s) the nucleus through the nuclear membrane pores ?

ⓐ DNA ⓑ Amino acids.

ⓒ RNA ⓓ Phospholipids.

14 The opposite figure represents a part of the living cell, what is the part that is **not** considered from the components of the nucleus ?

ⓐ (1).

ⓑ (2).

ⓒ (3).

ⓓ (4).

Second Answer the following questions (15 , 16)

15 The opposite graph illustrates two cells (A) and (B),

which of these cells has the ability to produce a larger amount of energy ?

Explain your answer.

16 "All the cells are surrounded by structures consisting of the same type of polymers".

How far is this statement correct ? With explanation.



Chapter 3

Lesson One

• Organization of Living Organisms.
• Differentiation of Cells and Diversity of Plant Tissues.

Organization of living organisms

• If we took the human as an example for the multicellular living organisms to identify his body building, we will find that :

Human body

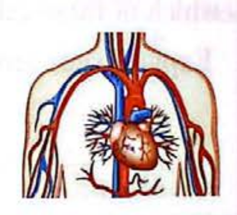
• It is composed of many systems which integrate and organize together forming the whole body.

• For example : circulatory, skeletal, muscular, nervous, digestive, respiratory, excretory and reproductive systems.

System

• It is composed of a group of organs that work together.

• For example : the circulatory system which consists of the heart, blood and blood vessels.



Organ

• It is composed of a group of different tissues that work together in an organized form to perform certain functions.

• For example : the heart which consists of a cardiac muscular tissue, nervous tissue and connective tissue, where all of them collaborate together to pump the blood from heart to all the body parts.

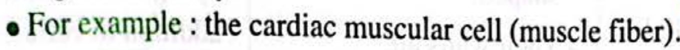
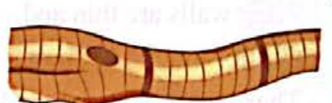


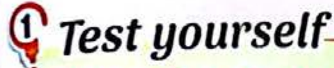
Tissue

- It is composed of a group of cells that are specialized in their work.
- For example : the muscular tissue of the heart wall which consists of a group of cardiac muscular cells.
- **The tissue may be :**
  - **Simple tissue :** consists of one type of cells that are symmetrical with each other in the structure, shape and function.
  - **Compound tissue :** consists of more than one type of cells.
- Tissues vary according to the difference of living organisms, the vital activities and functions that are performed by the tissues.


Cell

- The building and structural unit in the living organism's body.
- For example : the cardiac muscular cell (muscle fiber).

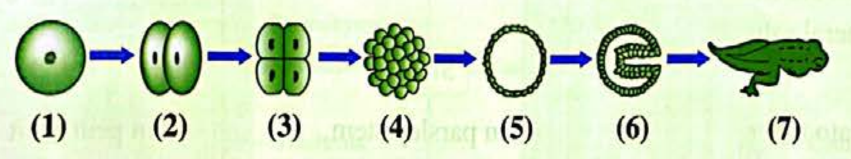


① Test yourself

Answered

Choose the correct answer :

The following figure illustrates the development (growth) stages of a toad, which level of the development represented by the stages no. (1) and no. (4) respectively ?

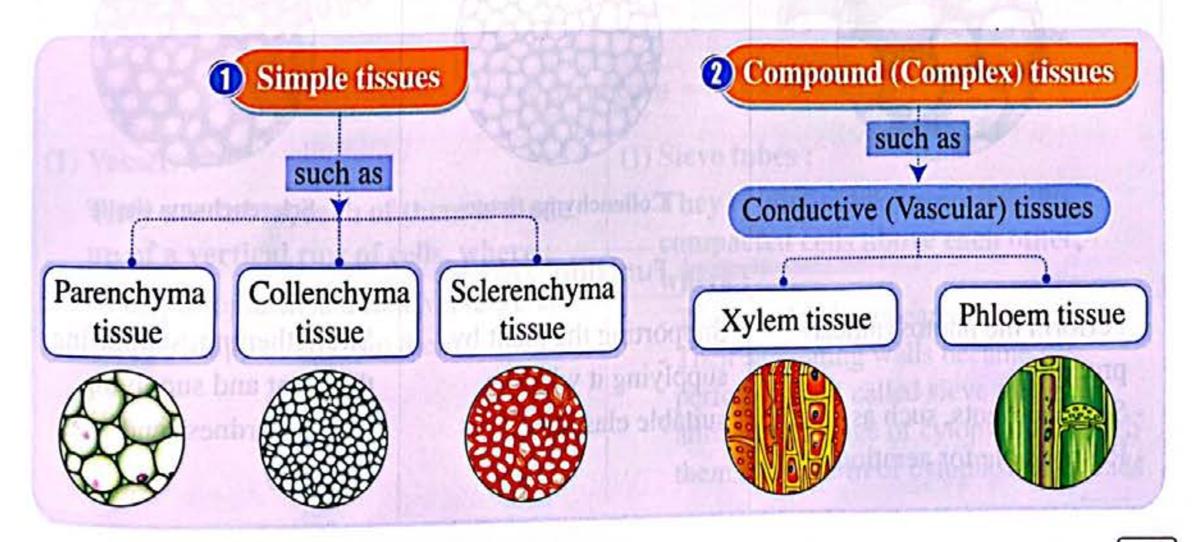


ⓐ Cell / organ. ⓑ Cell / tissue. ⓒ Tissue / cell. ⓓ Organ / cell.

- **In the following, we will study the most common plant and animal tissues in details :**

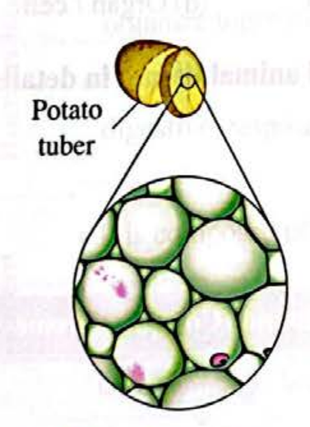
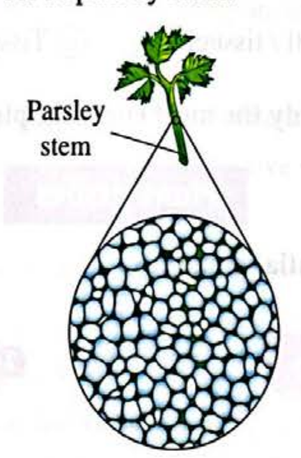
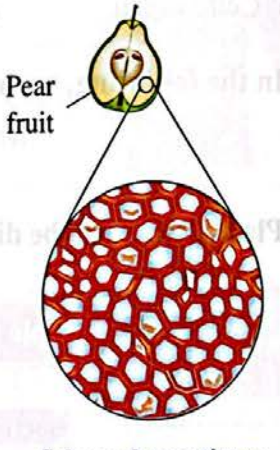
Plant tissues

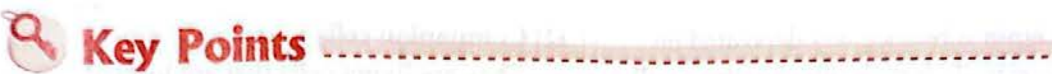
- **Plant tissues can be differentiated into :**





1 Simple tissues

1 Parenchyma tissue	2 Collenchyma tissue (Soft tissue)	3 Sclerenchyma tissue (Solid tissue)
Description		
A living tissue whose cells are characterized by the following : - Oval or round-shaped. - Their walls are thin and elastic. - There are spaces (intercellular spaces) among them for aeration. - Containing chloroplasts or chromoplasts or leucoplasts. - Containing one big vacuole or more that are filled with water and mineral salts	**A living tissue whose cells are characterized by the following :** - Somewhat rectangular-shaped. - Their walls are irregularly thickened by cellulose.	**A non-living tissue whose cells are characterized by :** Having thickened walls by lignin substance, in addition to cellulose.
Site		
As in potato tuber.  **Parenchyma tissue**	As in parsley stem.  **Collenchyma tissue**	As in pear fruit.  **Sclerenchyma tissue**
Function		
- Perform the photosynthesis process. - Store nutrients, such as starch. - Responsible for aeration.	Supporting the plant by supplying it with the suitable elasticity.	Strengthening, supporting the plant and supplying it with hardness and elasticity.



Key Points

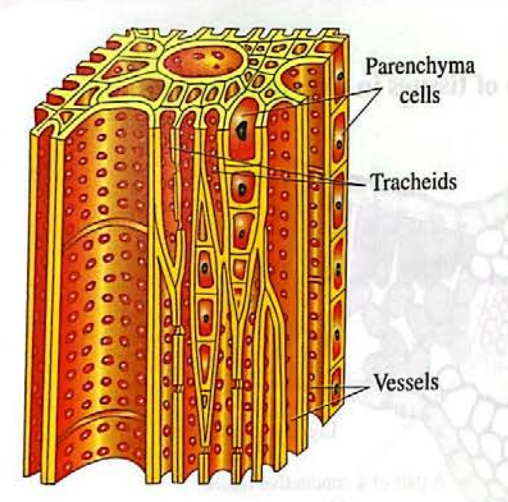
- Parenchyma and collenchyma tissues are living tissues whose cells containing nucleus and cell organelles and have the ability to perform different biological processes.
- Sclerenchyma tissue is a non-living tissue whose cells have neither nucleus nor cell organelles (i.e. the protoplasm is absent), therefore it can't perform different biological processes.

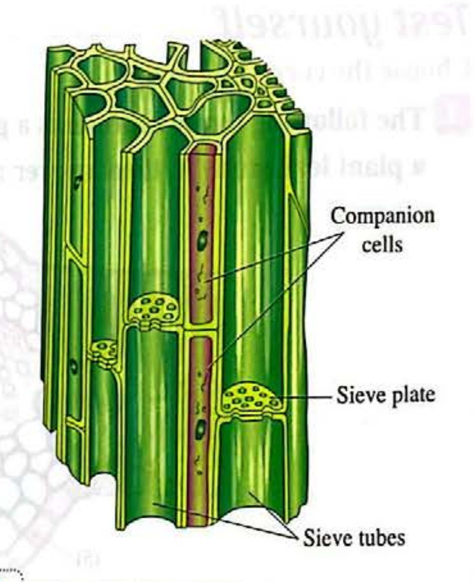
2 Compound (Complex) tissues

- From the examples of the plant compound tissues is the conductive or vascular tissues which are divided into two types whose function is transportation, they are :



① Xylem tissue	② Phloem tissue
Consists of : vessels – tracheids – parenchyma cells.	Consists of : sieve tubes – companion cells.





Structure

(1) Vessels :

They are tubes, each of them is made up of a vertical row of cells, where :

- The protoplasm and transverse walls were disappeared from them.

(1) Sieve tubes :

They originated from a vertically compacted cells above each other, where :

- Their nuclei disappeared.
- Their separating walls became perforated and called **sieve plates** to allow the passage of cytoplasm through them in the form of cytoplasmic threads.

- **Lignin** substance was deposited on their walls from inside. So, these cells are converted into long wide vessels, where water and salts are transported through them and their length ranges from few centimeters to several meters as in high trees.

(2) Tracheids :

Each of them is composed of one cell, where :

- The protoplasm disappeared from it.
- Their walls get lignified.

(2) Companion cells :

They are living cells that are located adjacent to the sieve tubes, to provide them with the required energy to perform their function.

Function

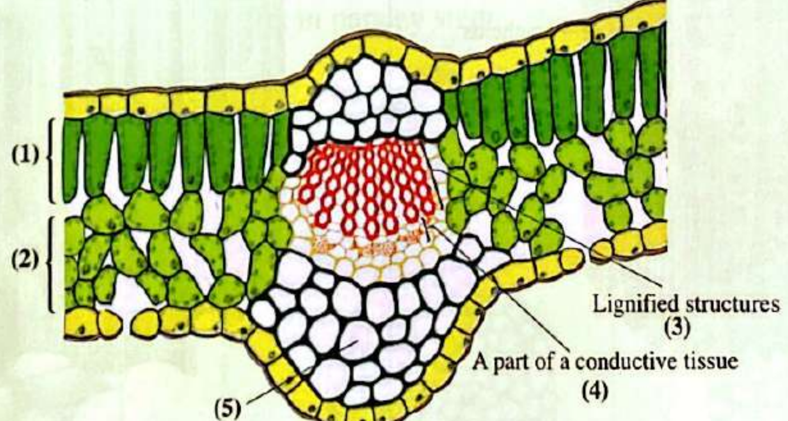
- Transporting water and salts from the root to the stem, then to the leaves. - Supporting the plant.	Transporting the nutrients that are resulted during photosynthesis from the leaves to the other plant parts.

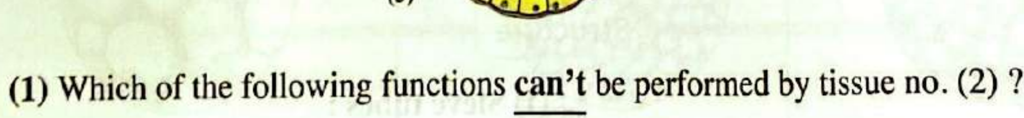
2 *Test yourself*

Answers

Choose the correct answer :

1 The following figure represents a group of tissues in a transverse section in a plant leaf, study it, then answer :





(1) Which of the following functions <u>**can't**</u> be performed by tissue no. (2) ?

ⓐ Photosynthesis process. ⓑ Aeration.

ⓒ Storing nutrients. ⓓ Transporting nutrients.

(2) In which of the following the photosynthesis process takes place ?

ⓐ (1) and (2). ⓑ (2) and (4).

ⓒ (2) and (3). ⓓ (1) and (3).

(3) Which of the following represents the tissues through which water and salts transferred from the roots to leaves ?

ⓐ (3) only.
ⓑ (4) only.
ⓒ (3) and (4).
ⓓ (1) and (4).

(4) Which of the following tissues is expected to have the highest starch content ?

ⓐ (1).
ⓑ (3).
ⓒ (4).
ⓓ (5).

2 Which of the following is applied to the plant tissues ?

ⓐ They don't perform specific functions.
ⓑ Cholorophyll is considered a main component in all types of plant tissues.
ⓒ Some of them have a complex structure and formed from different types of cells.
ⓓ All of them are formed from living cells.

- **Organization of Living Organisms.**
- **Differentiation of Cells and Diversity of Plant Tissues.**



The questions signed by ✻ are answered in detail.



Apply Analyze



First Multiple Choice Questions

1 What is the least organization level in the nervous system ?

ⓐ Nervous tissue. ⓑ Brain. ⓒ Nerve cell. ⓓ Mitochondrion.

2 The following figure illustrates a bean plant leaf and a transverse section in it, study it, then answer :

(X) (L) (Y) (M) (Z)

(1) Which of the following represent a cell and an organ respectively ?

ⓐ (X) and (Z).
ⓑ (X) and (L).
ⓒ (Z) and (Y).
ⓓ (L) and (Y).

(2) Which of the following represents the function of structure (M) ?

ⓐ Performing photosynthesis process. ⓑ Aeration.
ⓒ Supporting. ⓓ (a) and (b) together.

(3) In which of the following structure(s) the glucose molecules are formed ?

ⓐ (Y). ⓑ (X). ⓒ (X) and (Z). ⓓ (Y) and (Z).

3 Which of the following tissues work on supporting the plant ?

ⓐ Collenchyma and sclerenchyma tissues. ⓑ Parenchyma and sclerenchyma tissues.
ⓒ Parenchyma and collenchyma tissues. ⓓ Parenchyma and xylem tissues.

4 Which of the following are considered from the living structures in the cell ?

ⓐ Vessels. ⓑ Tracheids. ⓒ Companion cells. ⓓ Sieve tubes.

5 ✻ Through which of the following the product of the photosynthesis process transfers in the plant ?

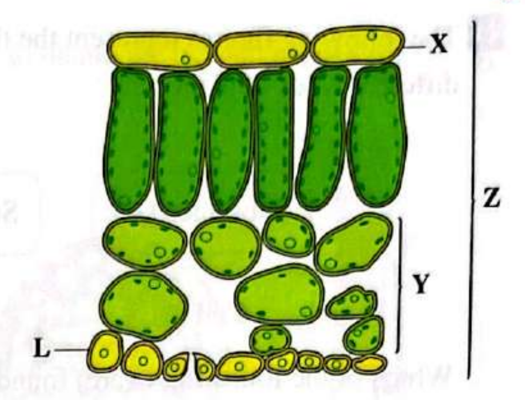
ⓐ Tracheids. ⓑ Vessels. ⓒ Parenchyma cells. ⓓ Sieve tubes.

6 What is the similarity between xylem and phloem ?

ⓐ The direction of the substances movement inside them.
ⓑ The structure.
ⓒ The type of thickening. ⓓ The type of tissue.



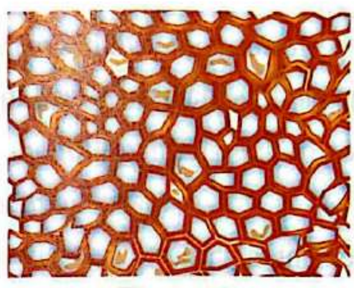
7 From the opposite figure that illustrates a transverse section in a plant leaf, which of the following represents a compound tissue, a simple tissue and a cell respectively ?

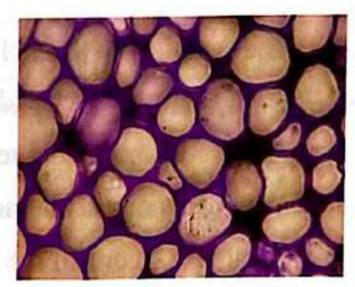


ⓐ X, Y & L
ⓑ X, L & Z
ⓒ Z, Y & L
ⓓ Z, L & X

---

8 The two following figures represent two different types of plant tissues :


Tissue (1)


Tissue (2)

What is the difference between them ?

ⓐ Tissue no. (1) is a living tissue and tissue no. (2) is a non-living tissue.
ⓑ Tissue no. (1) is a non-living tissue and tissue no. (2) is a living tissue.
ⓒ The cell walls of tissue no. (1) are thickened by cellulose and the cell walls of tissue no. (2) are thickened by lignin.
ⓓ Tissue no. (1) is soft and tissue no. (2) is solid.

---

9 How far are these statements "phloem tissue contains sieve tubes and companion cells", "the sieve tubes provide the companion cells with the energy needed to transfer the product of the photosynthesis from the leaves to all the plant parts" correct ?

ⓐ The two statements are correct.
ⓑ The first statement is correct and the second statement is wrong.
ⓒ The first statement is wrong and the second statement is correct.
ⓓ The two statements are wrong.

---

10 When the plant is exposed to an infection by a microbe, it may form what is called "tyloses" to prevent the spreading of microbe, but it prevents the water passage to the leaf, where will tyloses be formed ?

ⓐ Sieve tubes.
ⓑ Companion cells.
ⓒ Sclerenchyma cells.
ⓓ Xylem vessels.

11 The following figures represent the thickness and the structure of the cell walls of three different types of plant cells :

Cell (1)	Cell (2)	Cell (3)
Substance (A)	Substance (A)	Substance (A) + Substance (B)

Which of the following is(are) found in pear fruit ?

ⓐ Cell (1) only.
ⓑ Cell (2) only.
ⓒ Cell (1) and cell (2).
ⓓ Cell (1) and cell (3).

12 * How far are these statements "parenchyma tissue performs photosynthesis process to form glucose", "the plant stores glucose directly in the plastids that are present in it" correct ?

ⓐ The two statements are correct and related.
ⓑ The two statements are correct and not related.
ⓒ The first statement is correct and the second statement is wrong.
ⓓ The first statement is wrong and the second statement is correct.

13 * Which of the following plant structures **can't** transcribe RNA ?

ⓐ Xylem vessels only.
ⓑ Companion cells only.
ⓒ Sieve tubes only.
ⓓ Xylem vessels and sieve tubes.

14 Which of the following are found in the structure of the soil salts conductive tissue ?

ⓐ Sieve tubes.
ⓑ Tracheids.
ⓒ Companion cells.
ⓓ Sieve tubes and companion cells.

15 Which of the following performs most of metabolic processes ?

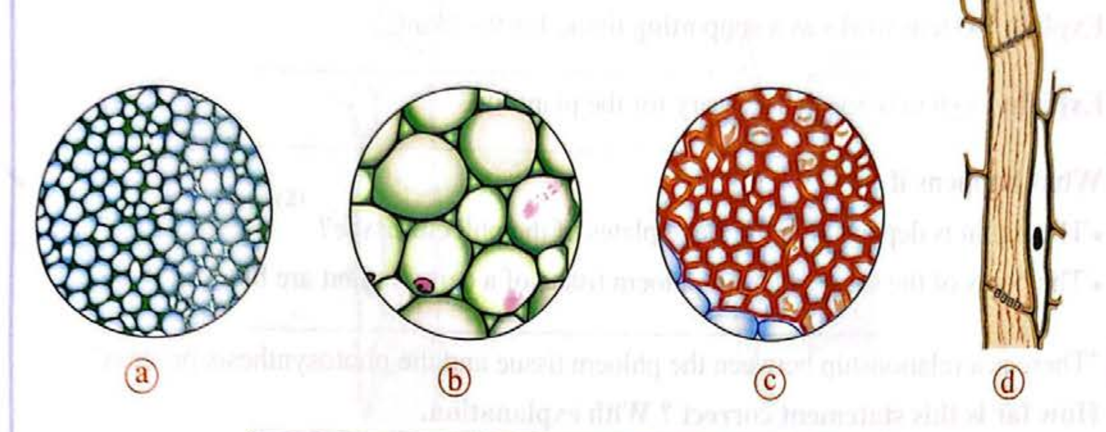
ⓐ Parenchyma cell.
ⓑ Xylem vessel.
ⓒ Sclerenchyma cell.
ⓓ Sieve tube.

16 What is the plant tissue whose cells are thickened by the cellulose substance only and it supports the growing plant parts ?

ⓐ Parenchyma tissue.
ⓑ Collenchyma tissue.
ⓒ Xylem vessels.
ⓓ Sclerenchyma tissue.

17 Which of the following tissues is used by the plant to obtain the oxygen needed for respiration process ?



18 If you know that the fibers of linen are characterized by their ability to bear the tensile, which of the following tissues do you think that they are formed from ?

ⓐ Parenchyma tissue. ⓑ Sclerenchyma tissue.

ⓒ Xylem tissue. ⓓ Phloem tissue.

19 The opposite figure represents a group of plant tissues in the stem of a higher plant, study it, then answer :



(1) What is the tissue that is responsible for aeration ?

ⓐ (1). ⓑ (2).

ⓒ (3). ⓓ (4).

(2) In which of the following it is expected to find tissue no. (1) ?

ⓐ Potato tuber. ⓑ Pear fruit.

ⓒ Parsley stems. ⓓ Sweet potato roots.

Second Miscellaneous Questions

1 "Mature tomato fruits perform photosynthesis process".
How far is this statement correct ? With explanation.

2 **Give reason for :** sweet potato roots are able to store nutrients, such as starch.

3 **What is the main plant tissue type that is found in :**

(1) Beet roots. (2) Pepper fruits. (3) Coriander plant stems.

4 **What happens if :** the plant is devoid of the sclerenchyma tissue ?

5 **What happens in case of :** the absence of the intercellular spaces from the parenchyma tissue ?

6 **Explain :** xylem works as a supporting tissue for the plant.

7 **Explain :** xylem tissue is necessary for the plant life.

8 **What happens if :**

- The lignin is deposited in the sieve plates of the phloem tissue?
- The pores of the sieve plates in phloem tissue of a certain plant are blocked?

9 "There is a relationship between the phloem tissue and the photosynthesis process".
How far is this statement correct ? With explanation.

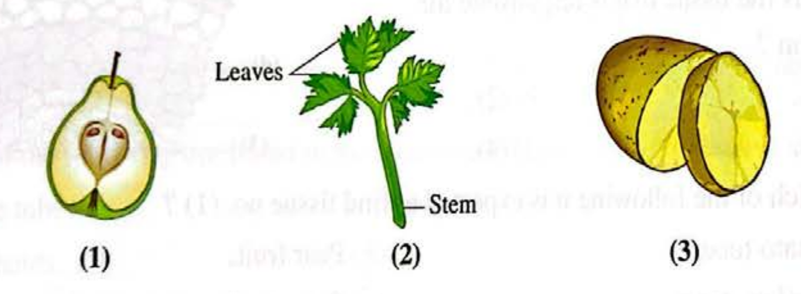
10 **What is the similarity between :** sclerenchyma tissue **and** xylem vessels ?

11 **Give an example for each of the following :**

(a) A plant tissue consists of symmetrical cells that don't have a nucleus.

(b) A plant tissue consists of different living and non-living cells.

12 **The following figures illustrate three different plant parts, study them :**



Write the number of the plant that represents each statement of the following :

(a) It is characterized by the presence of complex sugars storing cells.

(b) It is characterized by the presence of cellulose thickened cells only.

(c) It is characterized by the presence of simple sugars storing cells.

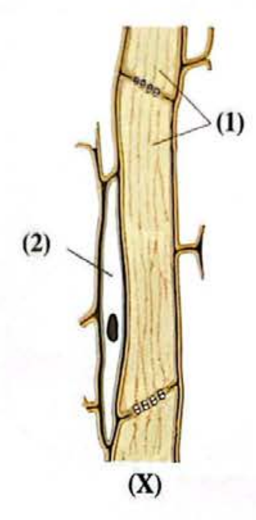
(d) It is characterized by the presence of sclerenchyma cells.

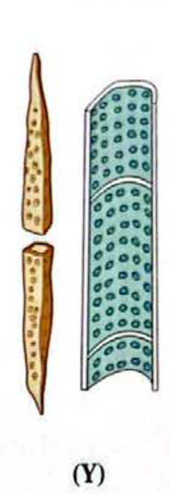
13 "Companion cells contain mitochondria".
How far is this statement correct ? With explanation.

14 **What happens in case of :** the absence of mitochondria from the phloem tissue in corn plant ?



15 The two following figures represent conductive tissues in the plant, study them, then answer :





(a) **What** do the two figures (X) and (Y) represent ?

(b) **What** do numbers (1) and (2) represent ?

(c) **What** is the difference between structure no. (1) and structure no. (2) ?

(d) **What** are the similarities and differences between the two figures (X) and (Y) ?

16 Explain : the efficiency of the phloem tissue decreases when mitochondria decrease.

17 The following table illustrates the substances by which the cell walls are thickened in three different types of cells that are present in plant tissues (X), (Y) and (Z), study it, then answer :

Tissue \ Thickening substance	Cellulose	Lignin
X	✗	✓
Y	✓	✓
Z	✓	✗

✓	Present
✗	Absent

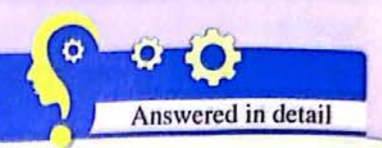
(a) **What** do tissues (X), (Y) and (Z) represent ?

(b) **What** is the importance of (X), (Y) and (Z) tissues ?

(c) **What** is the type of tissues (X) and (Y) ?

(d) **Give an example for** the site of tissue (Z) presence.

18 In a public garden, a farmer mistakenly removed the outer layer of a tree trunk at a height of half meter from the ground. If you know that the hight of this tree is 30 meters, and the removed layer contains phloem tissue, while the xylem tissue isn't affected, and after 10 days this tree began to wilt and die. **In the light of your study, explain this.**

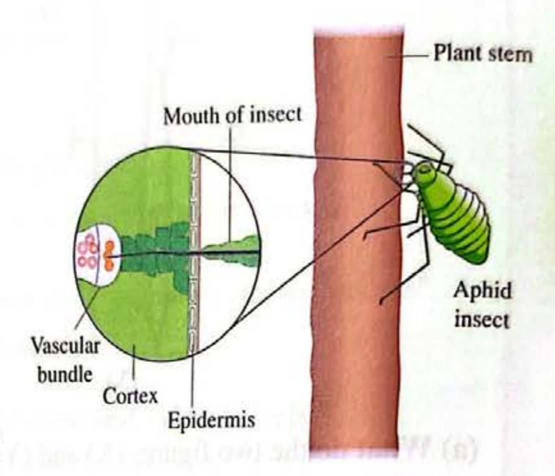


Questions that measure **high levels of thinking**

Answered in detail

Choose the correct answer :

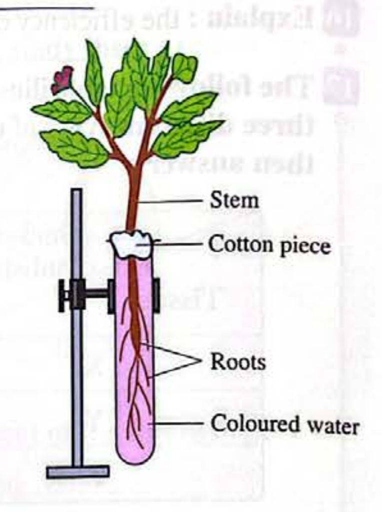
1 The opposite figure illustrates an experiment that was carried out by a researcher, where he let an insect feed on the plant sap by piercing its mouthparts in the plant stem tissues, then he made a transverse section in the plant stem to identify the region where the proboscis of the insect was inserted. He analyzed the liquid that was present in this vessel and found that it consists of sugars, from the previous we conclude that the region where the proboscis of the insect was inserted is the ....



ⓐ tracheids.
ⓑ xylem vessels.
ⓒ sieve tubes.
ⓓ parenchyma cells.

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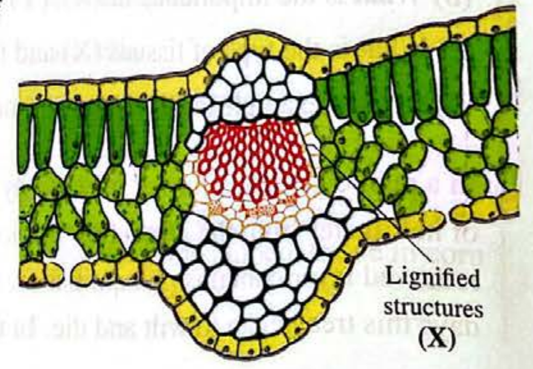
2 A researcher put a plant in a test tube containing coloured water, and left the tube for 24 hours as shown in figure, then he made a transverse section in the stem of this plant and examined it under the light microscope, which of the following is expected to be observed in this experiment ?



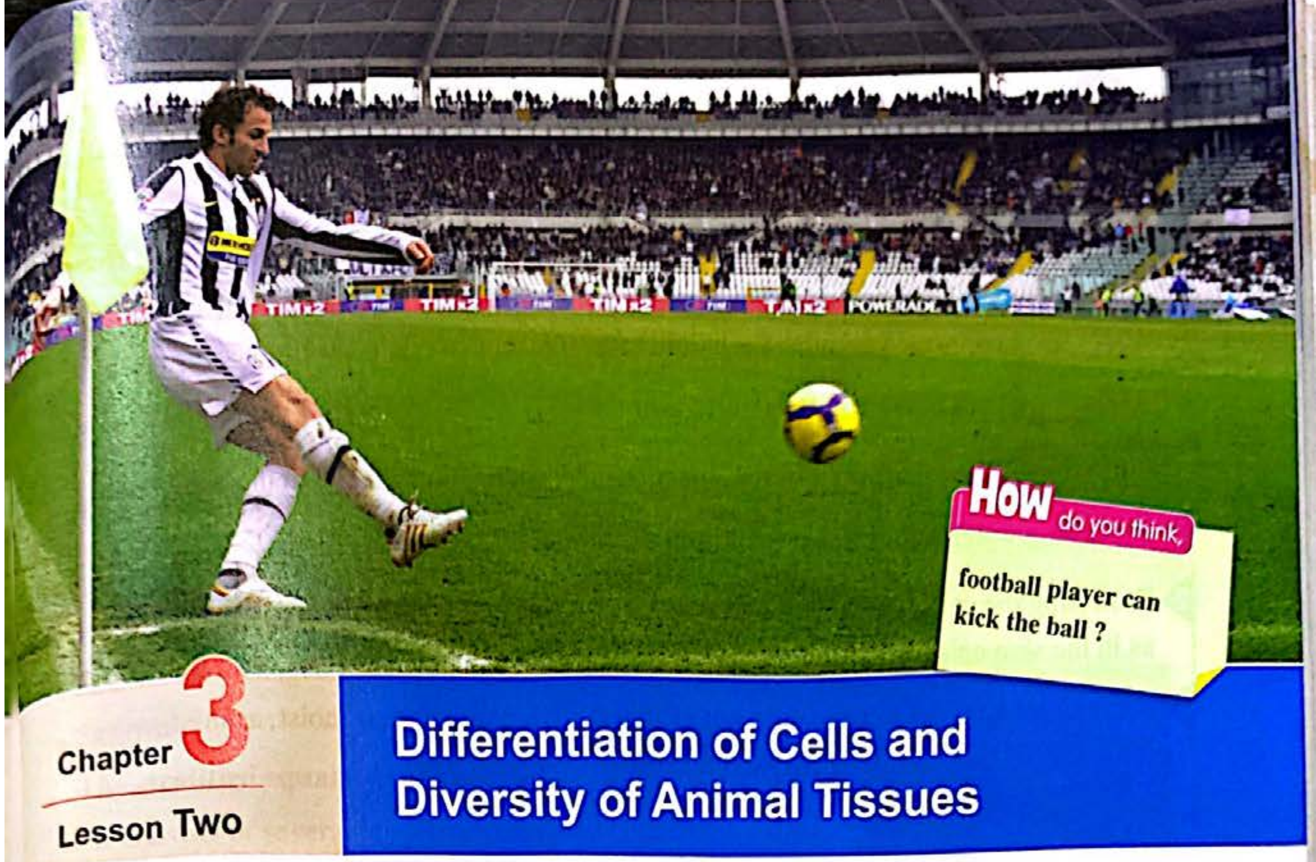
ⓐ Sieve tubes are coloured by the same colour of water.
ⓑ Xylem vessels are coloured by the same colour of water.
ⓒ Sieve tubes and xylem vessels are coloured by the same colour of water.
ⓓ Companion cells of the sieve tubes are coloured by the same colour of water.

---

3 Study the opposite figure, then answer, which of the following **doesn't** characterize tissue (X) ?



ⓐ Being a compound tissue.
ⓑ Most of the tissue is non-living structures.
ⓒ Specialized in transferring simple sugars to all the plant parts.
ⓓ Specialized in supporting plant.



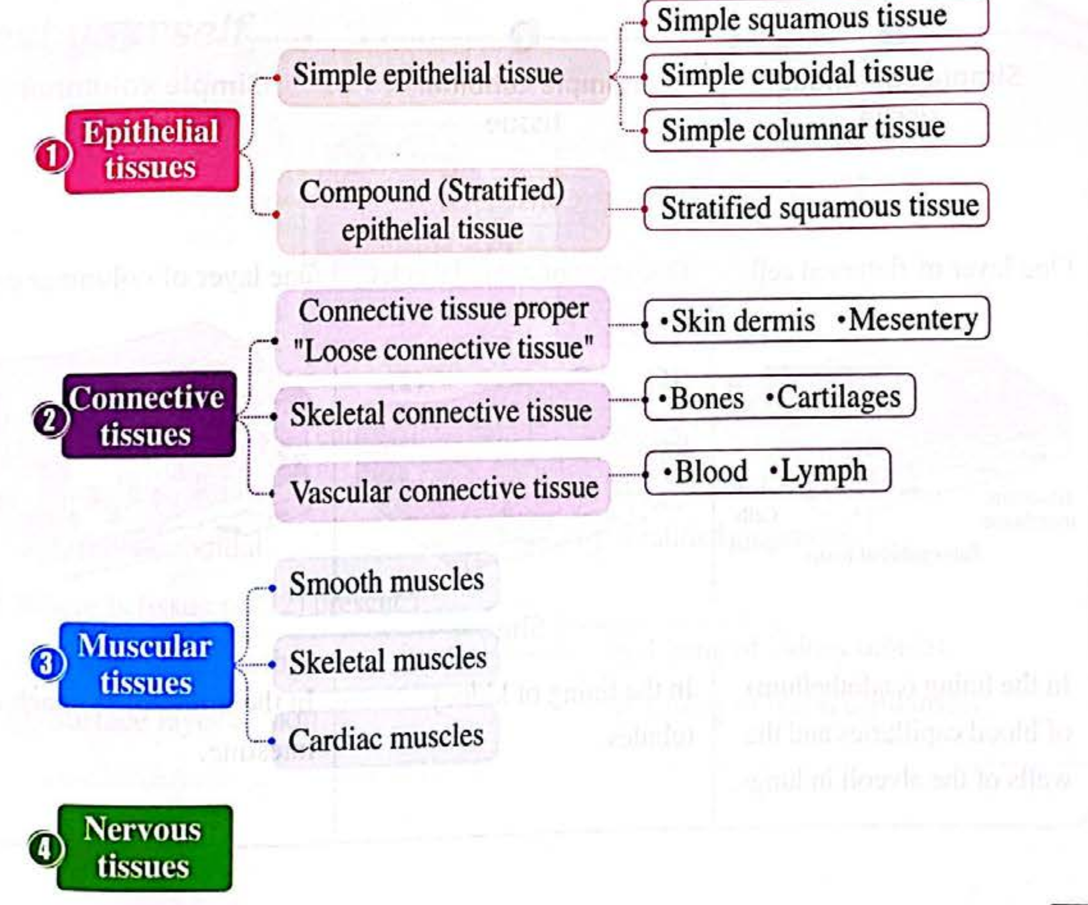
Chapter 3
Lesson Two

Differentiation of Cells and Diversity of Animal Tissues



Animal tissues

- **Animal tissues can be differentiated into four basic types, where each of them is adapted to the function it performs, as follows :**



1 Epithelial tissues

Structure They are composed of a great number of closely adjacent cells that are connected together by a little interstitial (intercellular) substance.

Location They cover the outer surface of the body or line the body's internal cavities.

Functions They perform different functions, depending on their site in the body, **such as :**

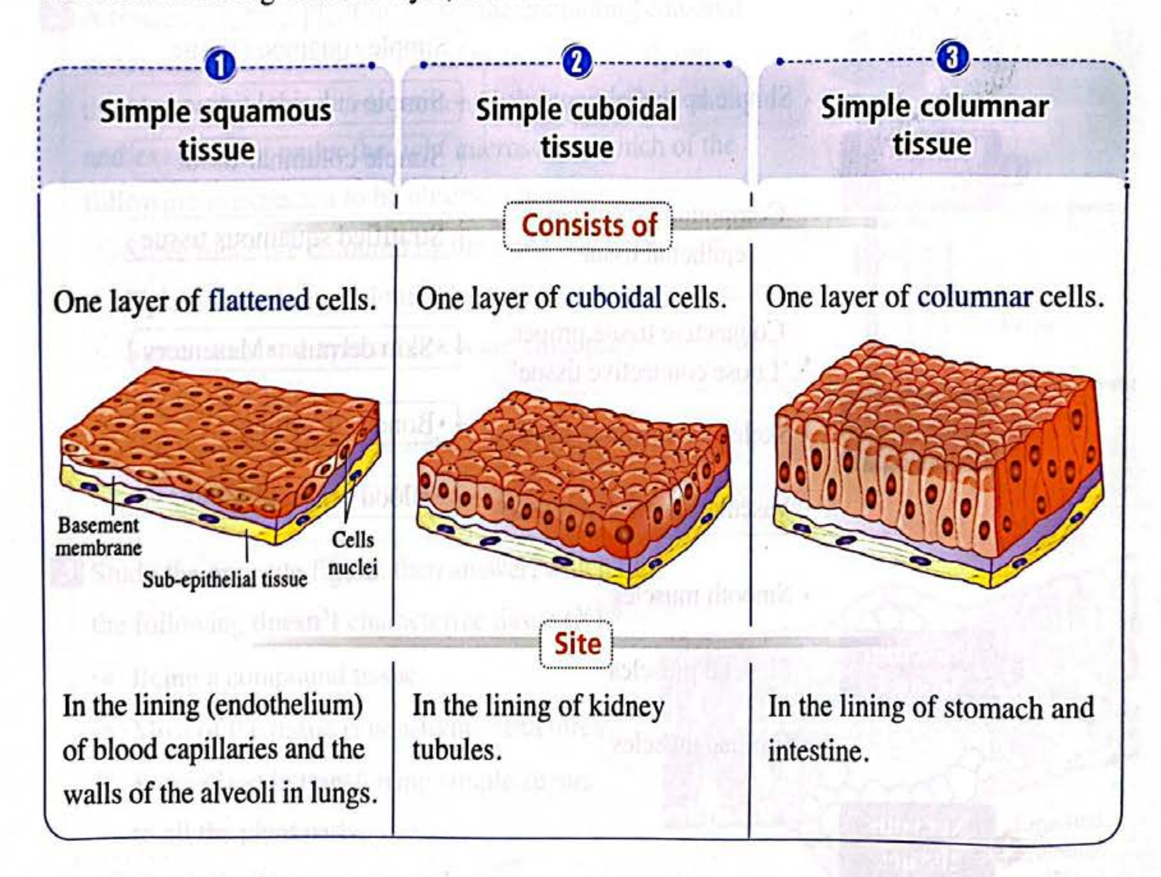
1. Absorbing water and digested food as in the lining of the digestive canal.
2. Protecting the cells which they cover from harms, drought and pathogens (as microbes) as in the skin epidermis.
3. Secreting the mucus to keep the cavities that they line smooth and moist, as in the lining of the digestive canal and trachea.

Types

They are divided into two main types, according to their shape and structure, **which are :**

A Simple epithelial tissue

- Its cells are arranged in one layer, **such as :**



	① Simple squamous tissue	② Simple cuboidal tissue	③ Simple columnar tissue
Consists of	One layer of flattened cells.	One layer of cuboidal cells.	One layer of columnar cells.
Site	In the lining (endothelium) of blood capillaries and the walls of the alveoli in lungs.	In the lining of kidney tubules.	In the lining of stomach and intestine.

Key Points

Simple squamous tissue : consists of one layer of flattened cells which facilitate the substances permeability through the tissue, therefore we found that this tissue :

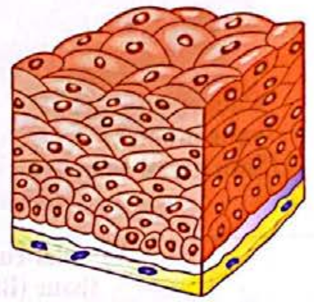
- Lines the blood capillaries' walls to facilitate the nutrients, gases and wastes transfer through it.
- Lines the alveoli walls to facilitate the gaseous exchange through it.

B Compound (Stratified) epithelial tissue

- Its cells are arranged in several layers.
- **Example :**

The stratified squamous tissue :

- It consists of several layers of compacted cells above each other.
- Its surface layer is squamous.
- **Site :** the tissue of skin epidermis.



Stratified squamous tissue

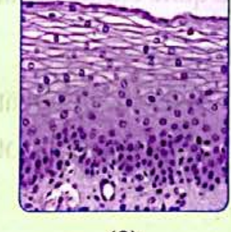
Test yourself

Answered

Study the two following figures, then choose the correct answer :



(1)



(2)

1 What is the type of the epithelial tissue in figure no. (1) ?

ⓐ Simple squamous. ⓑ Simple columnar.

ⓒ Simple cuboidal. ⓓ Stratified squamous.

2 Where is tissue no. (2) present ?

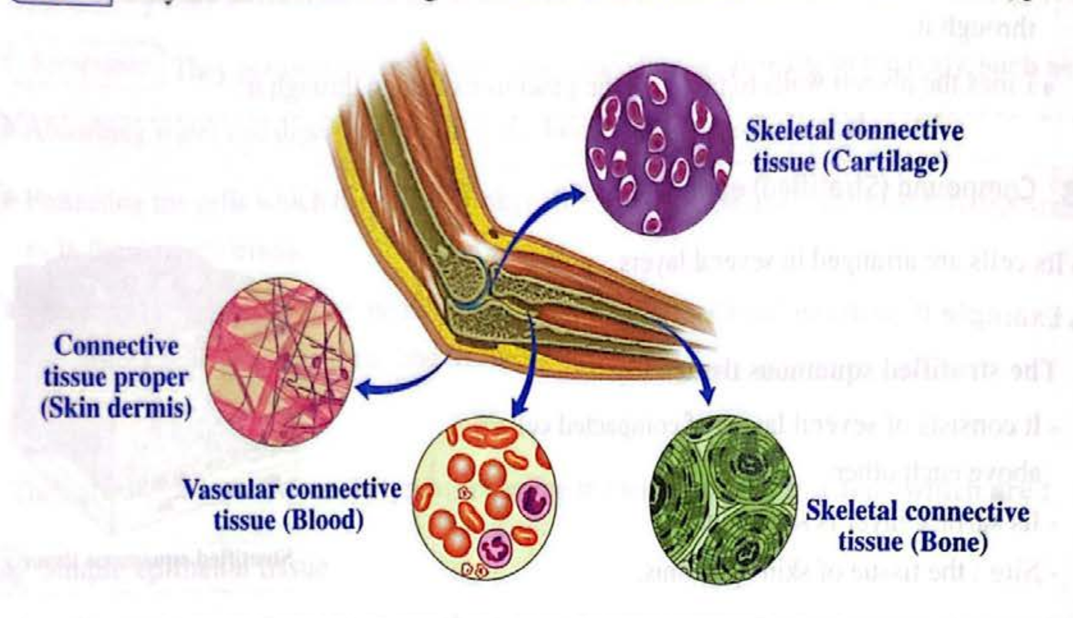
ⓐ Lining of stomach. ⓑ Lining of kidney tubules.

ⓒ Surface layer of skin. ⓓ Lining of blood capillaries.

2 Connective tissues

Structure They are made up of somewhat distant cells that are immersed in an interstitial or an intercellular substance which may be fluid, semi-solid or solid.

Types They are divided according to the kind of intercellular substance into three types :



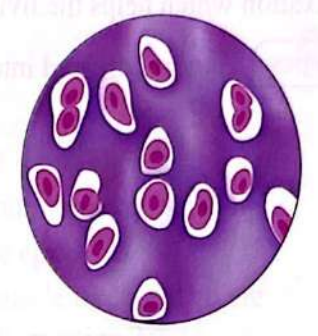
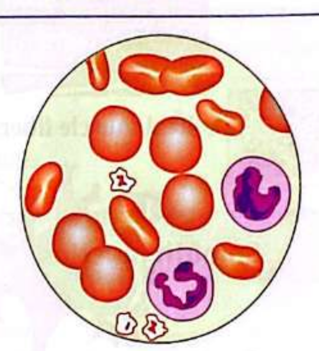
1 Connective tissue proper "Loose connective tissue" :

- **Characteristics :**
  - It is the most widespread type.
  - It gathers between being fairly solid and quite elastic (semi-solid).
- **Function :**
  It connects the different body tissues and organs with each other.
- **Site :**
  It is found beneath the skin epidermis (in skin dermis) and in the mesentery.

Connective tissue proper (Skin dermis)

For illustration only

Mesentery : is a membrane that attaches the folds of the small intestine together.

② **Skeletal connective tissue :**	**• Characteristics :** It is a tissue of a solid intercellular substance where calcium deposits in it, in case of bones. **• Function :** Supporting the body. **• It includes :** bones and cartilages.  **Skeletal connective tissue (Bones)**  **Skeletal connective tissue (Cartilages)**
 **Vascular connective tissue :**	**• Characteristics :** It is a tissue of a fluid intercellular substance. **• Function :** Transporting the digested food, gases and excretory substances. **• It includes :** Blood and lymph.  **Vascular connective tissue (Blood)**

Test yourself



Choose the correct answer :

1 Which of the following tissues is affected first in a person suffering from stomach ulcer ?

ⓐ Squamous epithelial tissue. ⓑ Columnar epithelial tissue.

ⓒ Cuboidal epithelial tissue. ⓓ Connective tissue proper.

2 Which of the following **doesn't** consist of connective tissue ?

ⓐ Pavilion of ear (outer ear). ⓑ Lymph.

ⓒ Skin epidermis. ⓓ Skin dermis.



3 Muscular tissues

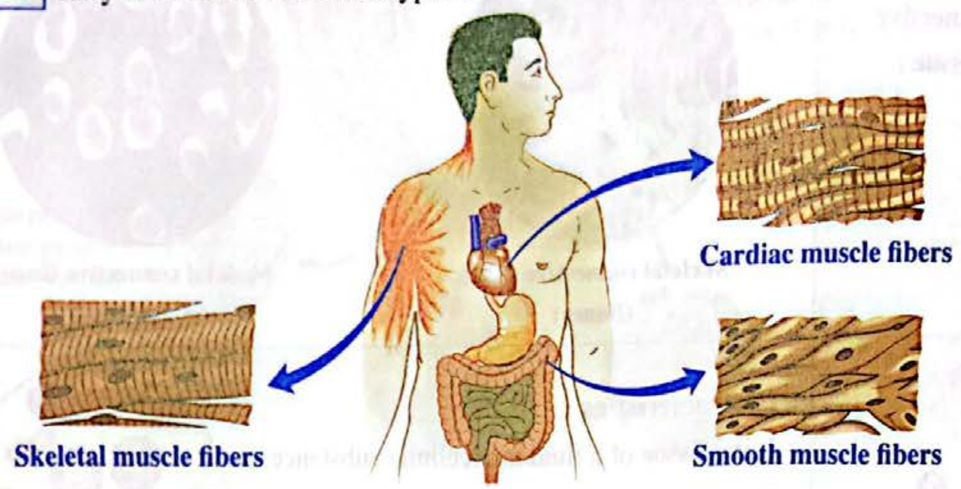


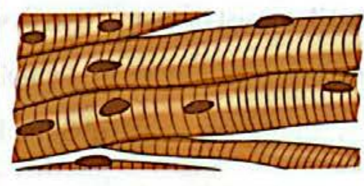
Structure They are made up of cells known as muscular cells or muscle fibers.

Characteristics

They are distinguished from the other body cells by their ability for contraction and relaxation which helps the living organism to move.

Types They are divided into three types :



① Smooth muscles	② Skeletal muscles	③ Cardiac muscles
	Structure	
They consist of unstriated involuntary muscle fibers.	They consist of striated voluntary muscle fibers.	- They consist of striated involuntary muscle fibers. - They contain intercalated discs that bind the muscle fibers together and make the heart beating in a rhythmic way as one functional unit.
		
Smooth muscle fibers	Skeletal muscle fibers	Cardiac muscle fibers

Site		
They are found in the walls of viscera, **such as** the walls of the digestive canal, the urinary bladder and the blood vessels.	They are usually found connected with the skeleton, **such as** the muscles of arms, legs and trunk.	They are found in the heart wall only.

3 *Test yourself*



Choose the correct answer :

1. What is the tissue that is responsible for the movement of fingers ?
   ⓐ Smooth muscular tissue.
   ⓑ Skeletal muscular tissue.
   ⓒ Cardiac muscular tissue.
   ⓓ Simple epithelial tissue.
2. Which of the following characteristics is applied to the muscle fibers which are responsible for the movement of nutrients inside the small intestine ?
   ⓐ Unstriated voluntary.
   ⓑ Unstriated involuntary.
   ⓒ Striated involuntary.
   ⓓ Striated voluntary.

4 Nervous tissues

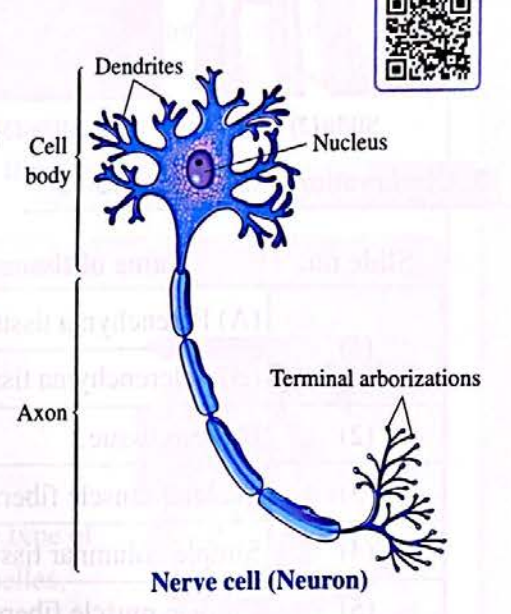
Structure

They consist of cells called the nerve cells (neurons). The nerve cell is considered the building and functional unit of the nervous system.



Function

The nervous tissues are responsible for regulating the different activities of the body organs, because they are specialized in receiving both the internal and external sensory stimuli and conducting them to the brain and spinal cord, then transmitting the motor nerve impulses from one of them to the effector organs (muscles or glands).



Nerve cell (Neuron)



Test yourself



Choose the correct answer :

Which of the following represents the importance of nerve cells in animal ?
ⓐ They act as the communication means among different cells.
ⓑ They transfer the nutrients to different cells.
ⓒ They regulate the cell division.
ⓓ They are responsible for gases exchange in the body.



Practical Activity 8 Examining different types of plant and animal tissues

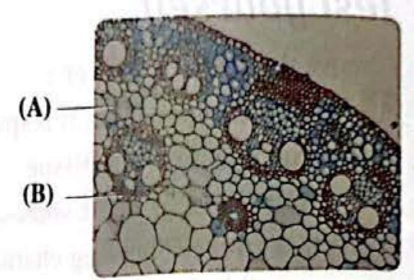


1. Used materials and tools :

- Prepared slides of various plant and animal tissues.
- A compound light microscope.

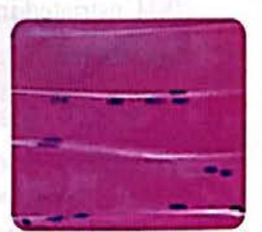
2. Procedure :

1. Examine microscopically the group of slides that your teacher will give you.
2. Specify the types of tissues shown in the given slides.

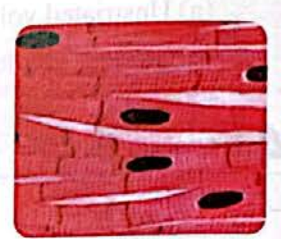


Slide (1)


Slide (2)


Slide (3)


Slide (4)


Slide (5)

3. Observation and conclusion :

Slide no.	Name of tissue	Type
(1)	(A) Parenchyma tissue.	(A) Simple plant tissue.
	(B) Sclerenchyma tissue.	(B) Simple plant tissue.
(2)	Phloem tissue.	Compound plant tissue.
(3)	Skeletal muscle fibers.	Animal tissue (Muscular tissue).
(4)	Simple columnar tissue.	Animal tissue (Simple epithelial tissue).
(5)	Cardiac muscle fibers.	Animal tissue (Muscular tissue).



5 Test yourself



Classify the following cells into their different tissues that they belong to :

1. Blood cells.
2. Spinal cord cells.
3. Parsley stem cells.
4. Skin epidermal cells.
5. Mesentery cells.
6. Potato tuber cells.

SCIENCE, TECHNOLOGY AND SOCIETY

Enrichment information

1 Stem cells

Stem cells

- They are cells that have the ability to form any type of specialized-cells types, such as muscular cells, liver cells, nerve cells and skin cells, according to specific environmental treatments at the laboratory.
- They are formed during the early stages of the embryonic development.



Embryonic cells in the early growth stages

Role of stem cells

Scientists and doctors have great hopes in treating a group of intractable diseases, such as :

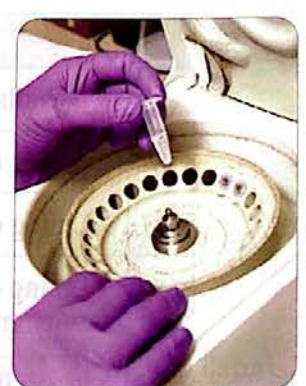
1. They are used to produce **dopamine substance** which is used to treat some nervous diseases as **Parkinson's disease**.
2. They are transplanted to give **cardiac muscle cells** as a compensation for the damaged cardiac muscles in **the heart patients**.
3. They are used to obtain cells that produce **insulin hormone** as a compensation for the decrease in pancreas secretion of this hormone in **the diabetic patients**.

2 Cell fractionation

Cell fractionation

It is one of the modern technologies that is used in :

1. Studying each type of the different cells that form a certain tissue.
2. Studying the different organelles that are forming one type of cells and this includes studying the site of these organelles, their functions and their components.
3. Studying the cellular molecules such as the biological macro-molecules, like enzymes.
4. Studying the biological processes that occur inside the cell.



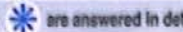
Ultracentrifuge apparatus

Methods of using cell fractionation technology

Cell fractionation technology depends on using ultracentrifuge apparatuses to separate the cell organelles at different speeds, depending on the difference of their densities.

Differentiation of Cells and Diversity of Animal Tissues

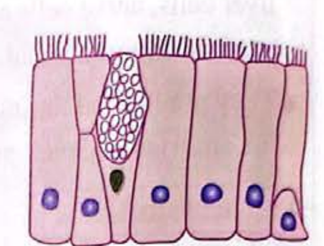


The questions signed by  are answered in detail. ● Understand ● Apply ● Analyze



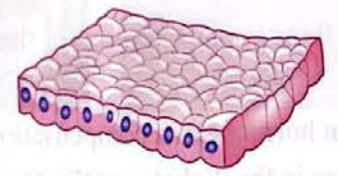
First Multiple Choice Questions

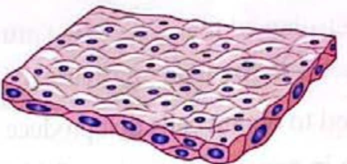
1 To which of the following animal tissues where the illustrated cells in the opposite figure belong ?



ⓐ Connective tissue.
ⓑ Nervous tissue.
ⓒ Muscular tissue.
ⓓ Epithelial tissue.

2 The two following figures illustrate two different types of animal cells :

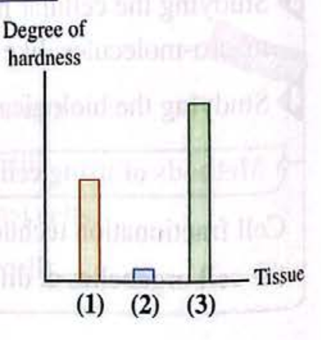

Figure (1)


Figure (2)

Which of the following choices in the following table is correct about the location of each of them ?

	Figure (1)	Figure (2)
ⓐ	Walls of kidney tubules	Lining of the small intestine
ⓑ	Lining of the small intestine	Lining of the alveoli
ⓒ	Lining of the kidney tubules	Walls of the alveoli
ⓓ	Lining of the small intestine	Lining of veins

3 ✻ The opposite graph illustrates the degree of hardness of three animal tissues, which of the following represents bones and cartilages respectively ?



ⓐ (2) and (1).
ⓑ (1) and (3).
ⓒ (3) and (1).
ⓓ (1) and (2).



4 ✻ What is the tissue that transports oxygen and carbon dioxide gases ?

ⓐ Connective tissue proper.
ⓑ Skeletal connective tissue.
ⓒ Vascular connective tissue.
ⓓ Compound epithelial tissue.

5 What is the type of muscles that are responsible for movement of head and limbs ?

ⓐ Striated involuntary.
ⓑ Unstriated voluntary.
ⓒ Unstriated involuntary.
ⓓ Striated voluntary.

6 Which of the following tissues **doesn't/don't** help the oesophagus in performing its role ?

ⓐ Connective tissue proper.
ⓑ Epithelial tissue.
ⓒ Striated muscles.
ⓓ Smooth muscles.

7 Which of the following tissues are found in the trachea of human ?

	Connective tissue proper	Epithelial tissue	Cartilaginous tissue
ⓐ	✓	✓	✗
ⓑ	✗	✓	✓
ⓒ	✓	✗	✓
ⓓ	✓	✓	✓

8 Which of the following tissues leads to pumping the blood from heart to all the body parts ?

ⓐ Epithelial tissue.
ⓑ Connective tissue.
ⓒ Muscular tissue.
ⓓ Nervous tissue.

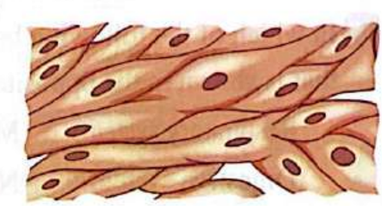
9 Which of the following is from the characteristics of the cardiac muscle ?

ⓐ Its cells are long and cylindrical.
ⓑ It is unstriated involuntary muscle.
ⓒ It is striated voluntary muscle.
ⓓ It is multinucleated and spindle-shaped muscle.

10 Which of the following consists of one layer of closely adjacent animal cells ?

ⓐ Blood.
ⓑ Lymph.
ⓒ Alveoli walls.
ⓓ Skin dermis.

11 Which type of muscles does the opposite figure represent ?



ⓐ Striated involuntary.
ⓑ Striated voluntary.
ⓒ Unstriated involuntary.
ⓓ Unstriated voluntary.

12 Which of the following **doesn't** characterize the skeletal muscular cells ?

(a) They store glycogen.
(b) They contain a large number of mitochondria.
(c) They are cylindrical in shape.
(d) They contain intercalated discs.

13 Which of the following tissues are found in the walls of veins ?

(a) Simple columnar epithelial tissues. (b) Smooth muscular tissues.
(c) Skeletal muscular tissues. (d) Cardiac muscular tissues.

14 Which of the following tissues help in the movement of the two upper limbs ?

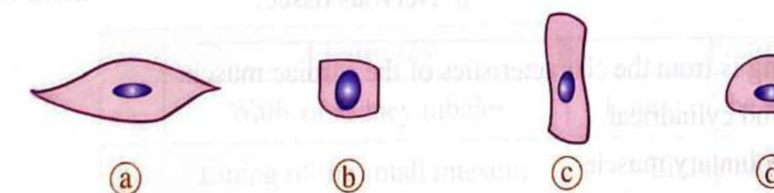
(a) Simple squamous epithelial tissues. (b) Smooth muscular tissues.
(c) Skeletal muscular tissues. (d) Cardiac muscular tissues.

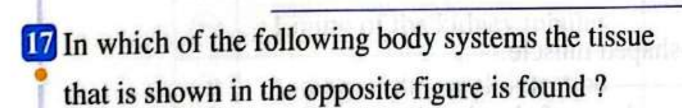
15 In which of the following pairs of cells, the highest content of mitochondria is found ?

(a) Plant xylem vessels and animal muscular cells.
(b) Bacterial cell and plant epidermal cell.
(c) Fertilized egg cell and mature red blood cell.
(d) Animal muscular cells and plant companion cells.

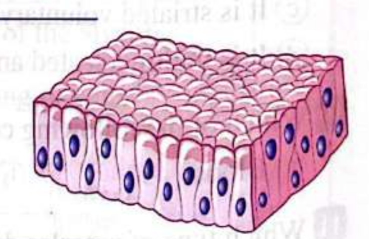
16 The opposite figure represents an alveolus in the lung, which of the following represents the shape of the cell in no. (1) ?

(1)



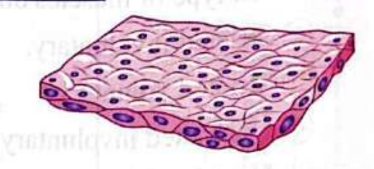


17 In which of the following body systems the tissue that is shown in the opposite figure is found ?



(a) Respiratory system. (b) Urinary system.
(c) Digestive system. (d) Circulatory system.

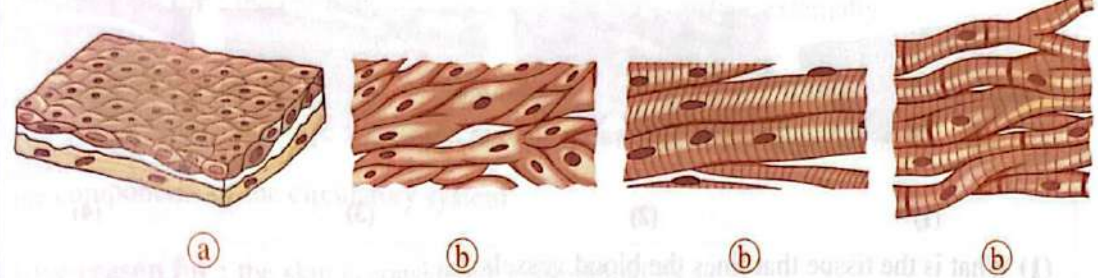
18 In which of the following body systems the tissue that is shown in the opposite figure is found ?



(a) Respiratory system. (b) Muscular system.
(c) Digestive system. (d) Nervous system.



19 Which of the following animal tissues is responsible for the movement of the nutrients through the human alimentary canal ?



ⓐ ⓑ ⓑ ⓑ

20 What is the type of the epithelial cells through which the absorption of glucose in the small intestine takes place ?

ⓐ Simple cuboidal cells. ⓑ Simple columnar cells.
ⓒ Simple squamous cells. ⓓ Stratified squamous cells.

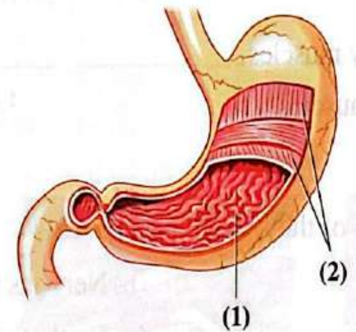
21 Cartilaginous rings forming the trachea are formed from the tissues that are devoid of calcium, what is the function of this tissue ?

ⓐ Support. ⓑ Sensation. ⓒ Digestion. ⓓ Transportation.

22 ✻ An infant suffers from a severe deficiency in calcium element, which of the following is more affected ?

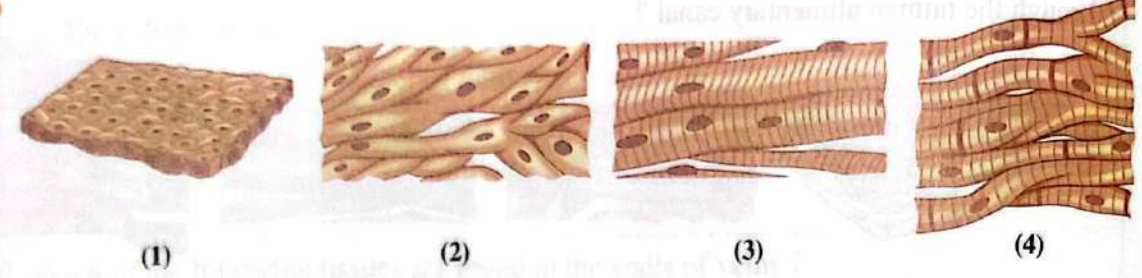
ⓐ The body length. ⓑ Skin colour. ⓒ The hair length. ⓓ Eye colour.

23 The following figure represents the human stomach, what do tissues no. (1) and (2) represent ?



	Tissue no. (1)	Tissue no. (2)
ⓐ	Simple columnar epithelial tissue	Smooth muscles
ⓑ	Smooth muscles	Simple columnar epithelial tissue
ⓒ	Simple squamous epithelial tissue	Smooth muscles
ⓓ	Smooth muscles	Simple cuboidal epithelial tissue

24 The following figures represent some animal tissues, study them, then answer :



(1) What is the tissue that lines the blood vessels ?

ⓐ (1). ⓑ (2). ⓒ (3). ⓓ (4).

(2) Which of the following represents the tissue that is found in the walls of blood vessels ?

ⓐ (1). ⓑ (2). ⓒ (3). ⓓ (4).

(3) What is the tissue that is responsible for the movement of the back region ?

ⓐ (1). ⓑ (2). ⓒ (3). ⓓ (4).

(4) What is the tissue that is responsible for the movement of blood during its flow inside the blood vessels ?

ⓐ (1). ⓑ (2). ⓒ (3). ⓓ (4).

(5) What is the tissue that contains structures that make the organ where it is found acts as one functional unit ?

ⓐ (1). ⓑ (2). ⓒ (3). ⓓ (4).

---

25 The opposite figure represents a section in the human heart, study it, then answer :

(1) What are the components of part no. (1) ?

ⓐ Connective tissue.

ⓑ Unstriated involuntary muscles.

ⓒ Striated involuntary muscles.

ⓓ Smooth muscles.

(2) What are the components of the fluid in part no. (2) ?

ⓐ Connective tissue. ⓑ Nervous tissue.

ⓒ Muscular tissue. ⓓ Epithelial tissue.

---

26 How far are these statements "all the animal cells are similar in shape", "but they are different from each other in the function", correct ?

ⓐ The two statements are correct.

ⓑ The two statements are wrong.

ⓒ The first statement is correct and the second statement is wrong.

ⓓ The first statement is wrong and the second statement is correct.



Second Miscellaneous Questions

1 **Give reason for :** the epithelial tissues cover the body surface externally.

2 If you know that the circulatory system consists of heart, blood vessels and blood. **In the light of your study, illustrate** the types of tissues that are found in the components of the circulatory system.

3 **Give reason for :** the skin is considered a compound tissue.

4 **What happens if :** the intercellular substance of the vascular connective tissue is changed ?

5 **Give an example for :** An animal tissue whose structure is affected by one of the mineral nutrients elements. **(In the light of your study)**

6 **What happens in case of :** the deposition of calcium in the intercellular substance of the cartilagenous tissue ?

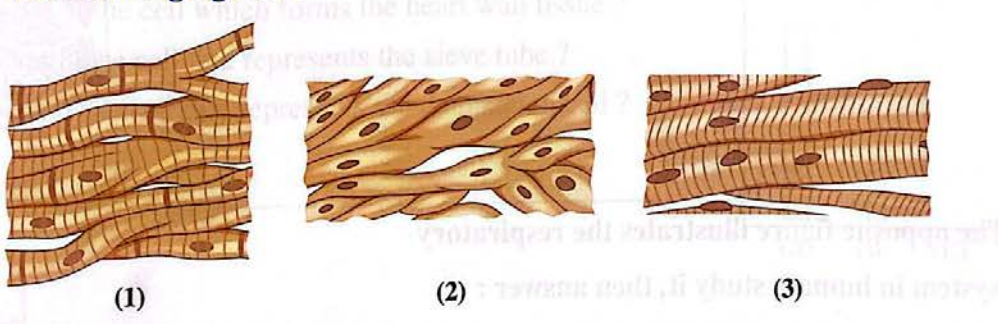
7 "When playing football, the most muscles that can be controlled are the smooth muscles". **How far is this statement correct ? With explanation.**

8 **Give reason for :** bones are harder than cartilages.

9 **Give reason for :** naming the skeletal muscles by this name.

10 **What is the difference between :** a muscle in a hand finger and a muscle in the oesophagus wall ?

11 **From the following figures :**



Write the number and name of the figure that indicates each of the following statements :

(a) It is found in the wall of the muscular sac in which the urine is collected.

(b) It is found in the lower limbs of the human body.

(c) It contains structures that have an important role in regulating the heartbeats.

12 "Muscular tissues are responsible for regulating the action of all organs in the body".
How far is this statement correct ? With explanation.

13 "The nerve cell has an ability for transferring the nerve impulses from the skin to muscles directly". **How far is this statement correct ? With explanation.**

14 **What happens if :** the stratified epithelial tissue is absent from its sites ?

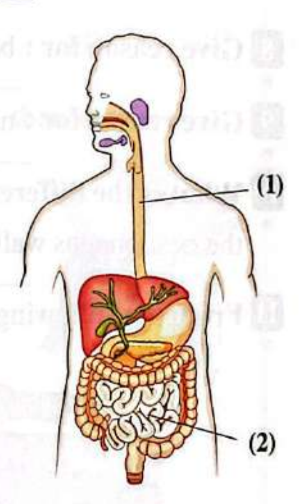
15 **The following table illustrates two types of animal tissues (X) and (Y) :**

	Cell (X)	Cell (Y)
Shape of cells	Long	Long
Cell division	Doesn't occur	Occurs

(a) **Determine** the name of each of (X) and (Y) cells.

(b) **What** is the feature that helps the tissue where cell (Y) is found to do its function ?

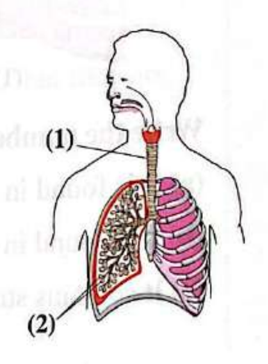
16 **The opposite figure illustrates the human digestive system, study it,** then **determine** the type of tissue which is found in the wall of each of structure (1) and structure (2).



17 **The opposite figure illustrates the respiratory system in human, study it, then answer :**

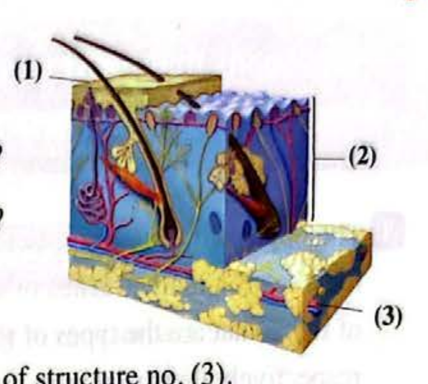
(a) **Illustrate** the type and the importance of the tissues that are found in structure no. (1).

(b) **Illustrate** the type of the tissue that is found in the walls of structure no. (2).





18 **The opposite figure illustrates a section in the human skin, study it, then answer :**

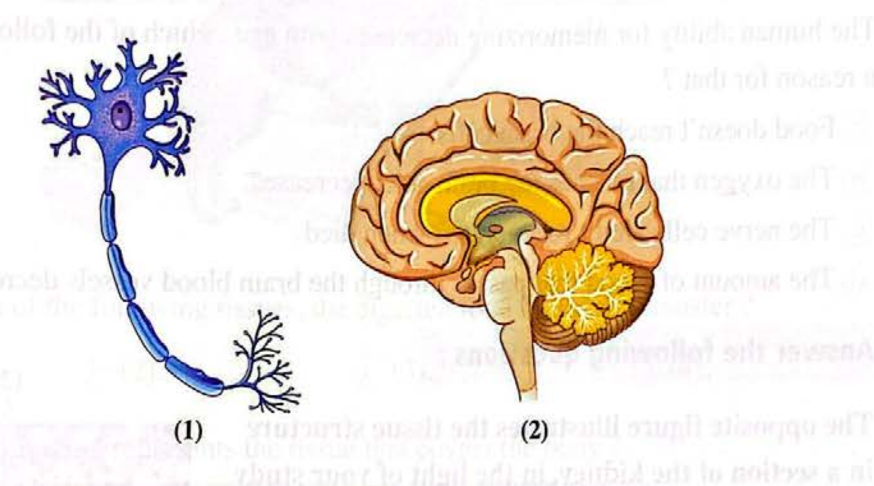


(a) What is the type of the tissue that is found in no. (1) ?

(b) What is the type of the tissue that is found in no. (2) ?

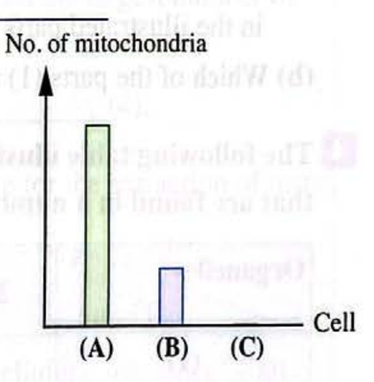
(c) "If you know that structure no. (3) carries the blood from the heart to all the body parts", **show** the type of the tissues that are found in the wall of structure no. (3).

19 **Study the following figures,** then **show** the relationship between figure no. (1) and figure no. (2).



20 "There is a relationship between the brain and the functions of some glands".
How far is this statement correct ? With explanation.

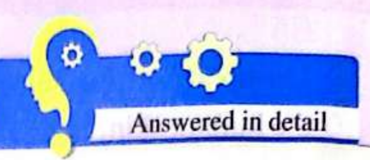
21 **Study the opposite graph, then answer :**



(a) **What** is the cell which forms the heart wall tissue ?

(b) **What** is the cell that represents the sieve tube ?

(c) **What** is the cell that represents the companion cell ?

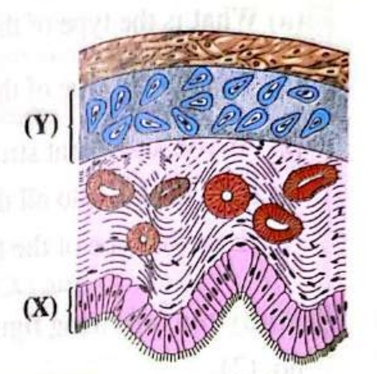


Questions that measure **high levels of thinking**

Answered in detail

Choose the correct answer :

1 The opposite figure illustrates the tissue structure for a section in the trachea of a rabbit, in the light of this, what are the types of tissues (X) and (Y) respectively that are referred to in this section ?



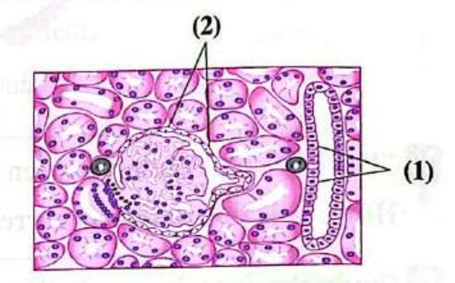
(a) Epithelial / Connective.
(b) Connective / Epithelial.
(c) Epithelial / Muscular.
(d) Connective / Muscular.

2 The human ability for memorizing decreases with age, which of the following may be a reason for that ?

(a) Food doesn't reach the brain cells.
(b) The oxygen that reaches the brain cells decreases.
(c) The nerve cells aren't regenerated when died.
(d) The amount of blood that passes through the brain blood vessels decreases.

Answer the following questions :

3 **The opposite figure illustrates the tissue structure in a section of the kidney, in the light of your study for the characteristics of animal tissues :**



(a) Determine the type of tissues that are found in the illustrated parts in this section.

(b) Which of the parts (1) and (2) represents the kidney tubules ?

4 **The following table illustrates the approximate percentages of some organelles that are found in a number of animal tissues, study it, then answer :**

Organelles / Tissue	Mitochondria	Ribosomes	Lysosomes
(1)	21%	3%	6%
(2)	12%	9%	9%
(3)	6%	21%	3%
(4)	6%	3%	21%

Conclude which of the previous tissues :

(a) Represents a vascular connective tissue.

(b) Plays an important role in flying of birds.

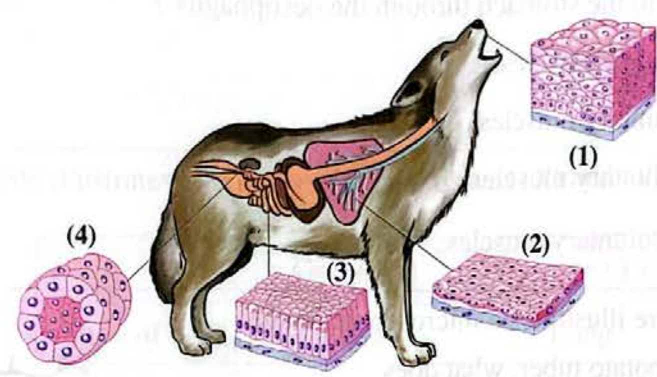


Test on Chapter 3

Differentiation of Cells and Diversity of Plant and Animal Tissues

First Choose the correct answer (1 : 14)

▸ The following figure illustrates some animal tissues, study it, then answer :



1 Through which of the following tissues, the digested food molecules transfer ?

ⓐ (1). ⓑ (2). ⓒ (3). ⓓ (4).

2 Which of the following represents the tissue that covers the body ?

ⓐ (1). ⓑ (2). ⓒ (3). ⓓ (4).

3 Which of the following represents the tissue whose cells contain the largest number of secretory vesicles ?

ⓐ (1). ⓑ (2). ⓒ (3). ⓓ (4).

4 Which of the following represents the tissue that is responsible for the extraction of urine from the blood ?

ⓐ (1). ⓑ (2). ⓒ (3). ⓓ (4).

5 How far are these statements "the cell walls of plant contain cellulose substance", "all the plant tissues can perform the photosynthesis process", correct ?

ⓐ The two statements are correct.

ⓑ The two statements are wrong.

ⓒ The first statement is correct and the second statement is wrong.

ⓓ The first statement is wrong and the second statement is correct.

6 During the movement or practicing exercises, the internal organs don't collide inside the internal cavity of the abdomen with each other, because they are attached together with .... tissue.

ⓐ simple squamous epithelial ⓑ simple columnar epithelial

ⓒ connective proper ⓓ muscular

7 What is the type of muscles whose contraction and relaxation lead to transferring the food from the pharynx to the stomach through the oesophagus ?

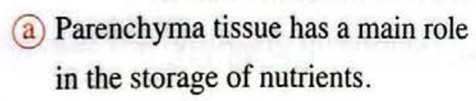
ⓐ Striated voluntary muscles.

ⓑ Striated involuntary muscles.

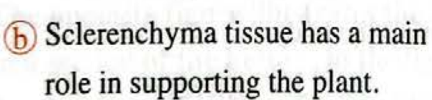
ⓒ Unstriated voluntary muscles.

ⓓ Unstriated involuntary muscles.

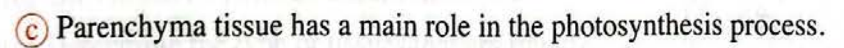
8 The opposite figure illustrates a microscopic image of a tissue in the potato tuber, what does this tissue represent and its role ?



ⓐ Parenchyma tissue has a main role in the storage of nutrients.



ⓑ Sclerenchyma tissue has a main role in supporting the plant.



ⓒ Parenchyma tissue has a main role in the photosynthesis process.

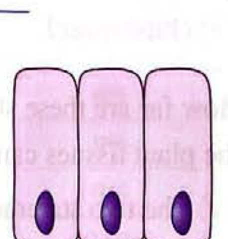
ⓓ Collenchyma tissue has a main role in supporting the plant.

9 Which of the following tissues **doesn't** participate in supporting the plant ?

ⓐ Xylem tissue. ⓑ Phloem tissue.

ⓒ Collenchyma tissue. ⓓ Sclerenchyma tissue.

10 The opposite figure represents some cells of an animal tissue, what is the function of these cells ?



ⓐ Protecting the body from drought.

ⓑ Absorbing the digested food.

ⓒ Transferring the digested food and wastes.

ⓓ Protecting the body against microbes.



11 What happens on the absence of parenchyma tissue from the plant ?

ⓐ The photosynthesis process stops.
ⓑ The plant stores carbohydrates.
ⓒ The plant loses its elasticity.
ⓓ The plant loses its support completely.

---

12 The opposite figure represents the structure of one of the conductive tissues of a plant, what does it represent ?

ⓐ Xylem parenchyma.
ⓑ Xylem vessel.
ⓒ Sieve tube.
ⓓ Tracheid.

---

13 The following table illustrates two types of animal tissues (X) and (Y) :

	Tissue (X)	Tissue (Y)
Shape of cells	Long	Long
Cell division	Doesn't divide	Divides

What are the sites of presence of tissues (X) and (Y) respectively ?

ⓐ Brain / Hands muscles.
ⓑ Alimentary canal wall / Heart muscle.
ⓒ Heart muscle / Brain.
ⓓ Lower limbs muscles / Spinal cord.

---

14 What is the similarity between the cardiac muscle and the leg muscles ?

ⓐ Both are striated muscles.
ⓑ Both are involuntary muscles.
ⓒ Both are unstriated muscles.
ⓓ Both are voluntary muscles.

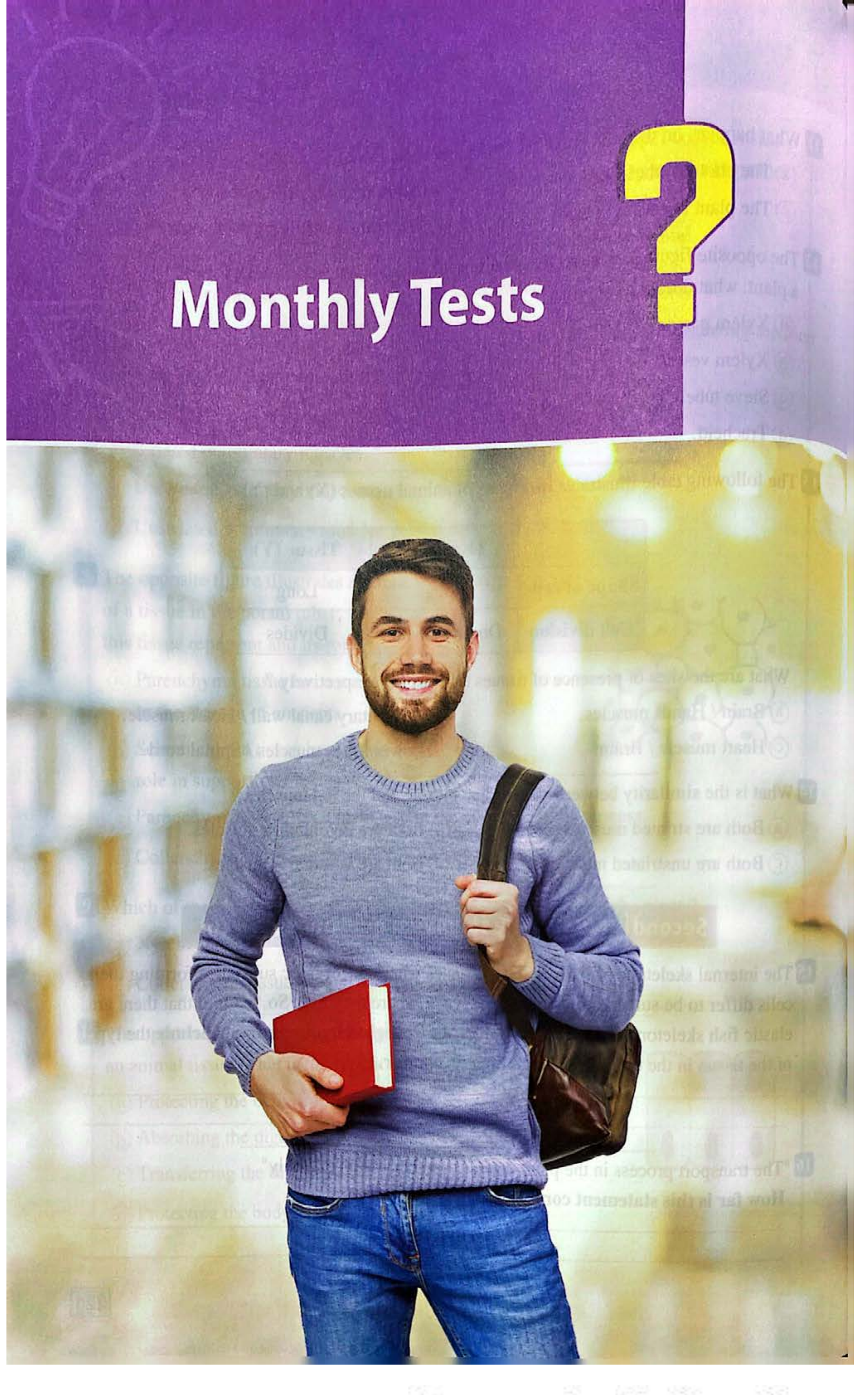
Second | Answer the following questions (15 , 16)

15 The internal skeletons of fish consist of tissues where the organic substance forming their cells differ to be suitable for the depth of water where they live. So, we find that there are elastic fish skeletons and others are harder. **In the light of your study, conclude** the type of the tissue in the two cases. **Explain your answer.**

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16 "The transport process in the plant depends on the living cells only".
How far is this statement correct ? With explanation.

Monthly Tests



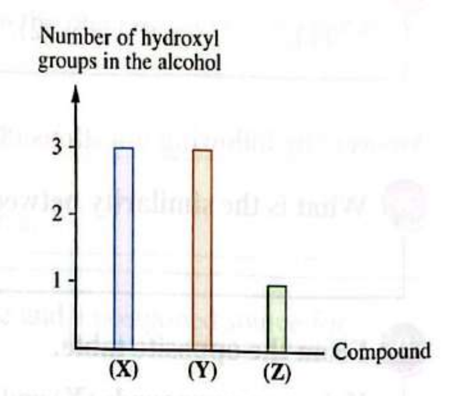
Test 1 On The First Month

Choose the correct answer (1 : 7) :

1 Which of the following is applied to haemoglobin protein and casein protein respectively ?

(a) Simple protein / Conjugated protein.
(b) Conjugated protein / Simple protein.
(c) Iron enters in its structure / Phosphorus enters in its structure.
(d) It is called a nucleic protein / It is called a phosphoprotein.

2 The opposite graph represents the number of hydroxyl groups in the alcohols which enter in the structure of the organic compounds (X), (Y) and (Z), if you know that (Y) and (Z) have the same physical state, while (X) differs from them. Which of the following may contain compounds (X), (Y) and (Z) respectively ?



(a) Cactus leaves / Condensed cream / Corn grains.
(b) Sesame grains / Condensed cream / *Opuntia*.
(c) Full-cream yoghurt / Corn grains / Cactus leaves.
(d) Corn grains / *Opuntia* / Full-cream yoghurt.

3 Which of the following represents RNA molecule and glycogen molecule respectively ?

(a) Thymine base enters in its structure / It is formed of fatty acids.
(b) Ribose sugar enters in its structure / It is formed of repeated glucose units.
(c) Deoxyribose sugar enters in its structure / It is formed of fructose units.
(d) It enters in the structure of chromosomes / It enters in the structure of cell membranes.

4 Which of the following is from the similarities between steroids and cellulose ?

(a) Both are complex sugars.
(b) Both are derived lipids (lipids derivatives).
(c) Both don't dissolve in water.
(d) Both enter in the structure of plant cell walls.

5 Which of the following represents assymetrical disaccharide and is present in the plant cells?

(a) Maltose. (b) Lactose. (c) Sucrose. (d) Glucose.

The opposite table shows the percentage of each of the proteins, lipids and carbohydrates in 4 different meals :

Meal	Proteins%	Lipids%	Carbohydrates%
(1)	76	9	15
(2)	17	0	83
(3)	33	32	35
(4)	15	83	2

6 Which meal of them has a greater chance to be stored in the liver ?

ⓐ (1). ⓑ (2). ⓒ (3). ⓓ (4).

7 From which meal of them the body makes greatly benefit in building its tissues ?

ⓐ (1). ⓑ (2). ⓒ (3). ⓓ (4).

Answer the following questions (8 : 10) :

8 **What is the similarity between :** glycine amino acid and DNA nucleic acid ?

9 **From the opposite table.**

If the two compounds **(X)** and **(Y)** are from the same kind of the biological macro-molecules, while compound **(Z)** differs from them :

Compound \ Element	Oxygen	Phosphorus	Nitrogen
(X)	✓	✓	✓
(Y)	✓	–	✓
(Z)	✓	✓	✓

What does compound **(Z)** represent if it is :

(a) A monomer of one of the complex biological compounds ?

(b) A polymer which enters in the structure of the cell membrane ?

10 **What is the relation between :** iodine and thyroxine hormone ?

Test 2 On The First Month

Choose the correct answer (1 : 7) :

1. Which of the following molecules contain carbon atoms ?
   (a) Water. (b) Table salt. (c) Ammonia. (d) Glucose.

2. What is the least number of hydrogen atoms that share in monosaccharide formation ?
   (a) 4 (b) 6 (c) 8 (d) 10

3. Which of the following illustrates the similarity between the plant oil and the animal fat ?
   (a) Both are present in a liquid state.
   (b) Both are present in a solid state.
   (c) Both are from biological macro-molecules.
   (d) Both contain unsaturated fatty acids in their structures.

4. Which of the following foodstuff represent a fast source and a postponed source for obtaining energy respectively ?
   (a) Pasta / Malt solution. (b) Butter / Rice.
   (c) Bread / Sugarcane juice. (d) Sugarcane juice / Butter.

5. Which of the following statements represents the correct arrangement for the relation between the nucleic acids and the appearance of genetic trait ?
   (a) Amino acids / Protein / RNA / DNA / Genetic trait.
   (b) Amino acids / Protein / DNA / RNA / Genetic trait.
   (c) DNA / RNA / Amino acids / Protein / Genetic trait.
   (d) RNA / DNA / Amino acids / Protein / Genetic trait.

6. On the formation of disaccharide and dipeptide; the secondary product is ....
   (a) H_2O (b) O_2 (c) CO_2 (d) N_2

7. The following diagram illustrates a plant complex sugar :

   What does this figure represent ?
   (a) Starch. (b) Glycogen. (c) Sucrose. (d) Lactose.

Answer the following questions (8 : 10) :

8 **What is the similarity between :** galactose and lactose ?

9 **What is the number of :** free amino groups in a polypeptide chain that is formed of 15 amino acids ?

10 **Study the two following figures, then determine the mistake in each of them.**

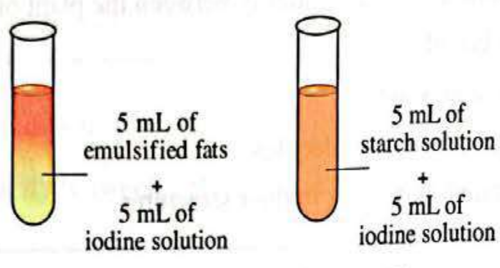
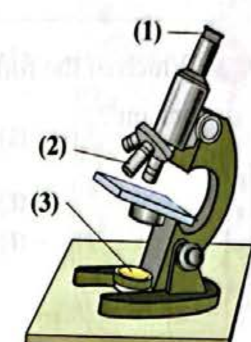


Figure (1) Figure (2)

Test 1  On The Second Month

Choose the correct answer (1 : 7) :

1. From the opposite figure, which of the following microscope components is used to calculate the microscope magnifying power ?



ⓐ (1) only.

ⓑ (2) only.

ⓒ (1) , (2).

ⓓ (2) , (3).

2. Which of the following belongs to cell wall and cell membrane respectively ?

ⓐ It surrounds the plant cell only / It surrounds the animal cell only.

ⓑ It surrounds the plant cell only / It surrounds the plant and animal cells cytoplasm.

ⓒ It separates between the cell contents and the surrounding medium / It protects and supports the cell.

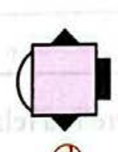
ⓓ It prevents the spreading out of protoplasm outside the cell / It allows the passage of dissolved substances.

3. Which of the following enzymes is highly specific ?


ⓐ


ⓑ


ⓒ


ⓓ

4. Which of the following polymers whose formation is affected by the absence of ribosomes from the living cell ?

ⓐ Carbohydrates. ⓑ Proteins. ⓒ Lipids. ⓓ DNA

5. Which of the following organelles is/are **not** affected by carbon tetrachloride ?

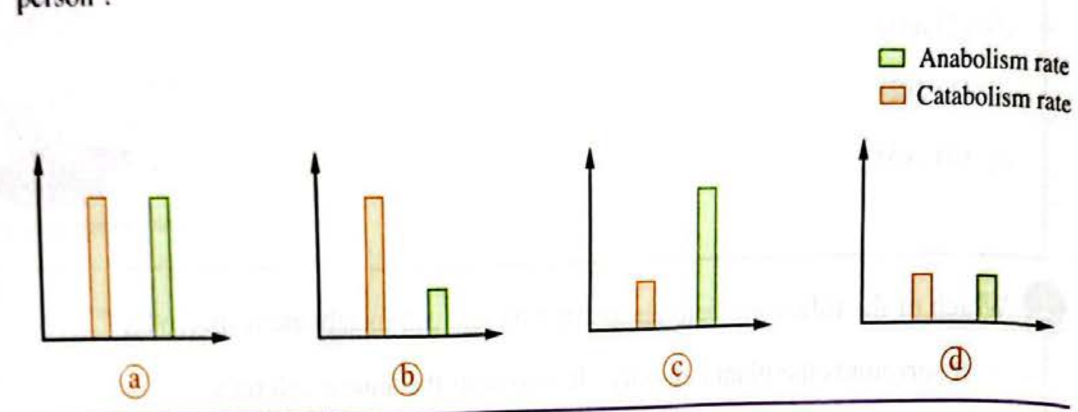
ⓐ Endoplasmic reticulum. ⓑ Golgi bodies.

ⓒ Centrosome. ⓓ Lysosomes.

6 If you know that the adrenal gland cortex produces steroids. Which of the following organells is/are found abundantly in its cells?

ⓐ Smooth endoplasmic reticulum.
ⓑ Rough endoplasmic.
ⓒ Ribosomes.
ⓓ Lysosomes.

7 Which of the following graphs refers to anabolism and catabolism rates for an elder person ?



Answer the following questions (8 : 10) :

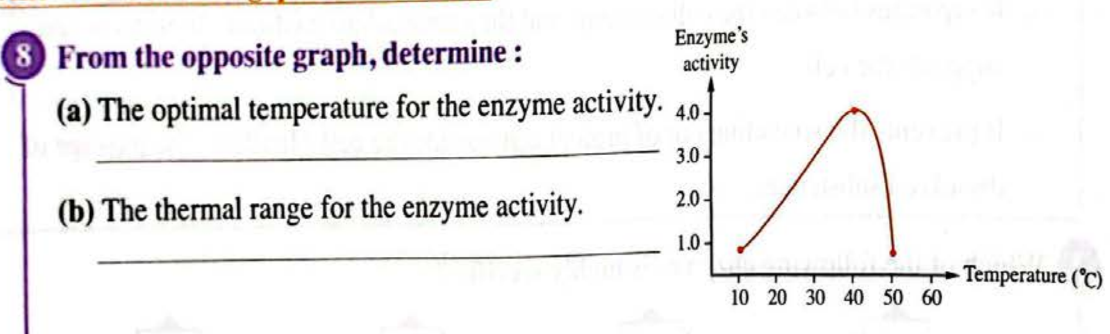
8 **From the opposite graph, determine :**

(a) The optimal temperature for the enzyme activity.

____

(b) The thermal range for the enzyme activity.

____



9 "There is a relation between nucleus and formation of enzymes inside the living cell."
How far is this statement correct ? With explanation.

____

10 "Using dyes in samples examination is considered a double-edged weapon" **Explain.**

____

Test 2 On The Second Month

Choose the correct answer (1 : 7) :

The opposite figure represents a diagrammatic figure of a plant cell :

1 Which part regulates the passage of substances from and to the cell ?

ⓐ (1). ⓑ (2).

ⓒ (3). ⓓ (4).

2 Which part that contains the information required for controlling the cell shape ?

ⓐ (1). ⓑ (2).

ⓒ (3). ⓓ (4).

3 If the objective lens magnifying power in the light microscope equals 100 times and the ocular lens magnifying power equals 20 times, which of the following statements is correct ?

ⓐ The microscope magnifying power = 200 times.

ⓑ The image will be more clear.

ⓒ The image will be unclear.

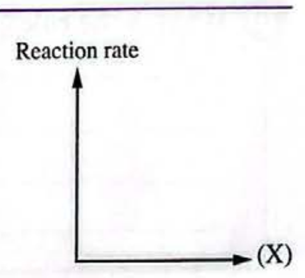
ⓓ The image will be highly contrasted.

4 Which of the following represents the building unit of algae cell wall ?

ⓐ Sucrose. ⓑ Starch.

ⓒ Cellulose. ⓓ Glucose.

5 In the opposite figure, which of the following **can't** be represented by X-axis ?



ⓐ Substrate concentration.

ⓑ Enzyme's activity.

ⓒ Temperature.

ⓓ Enzyme's concentration.

6 What is the similarity between ribosomes and rough endoplasmic reticulum ?

(a) Both enter in lipids synthesis.

(b) Both are from membranous organelles.

(c) Both are from non-membranous organelles.

(d) Both enter in protein synthesis.

7 Which of the following is considered from cell theory principles ?

(a) All cells contain plasma membrane.

(b) All cells contain organic molecules.

(c) Cell is the functional unit of the living organism.

(d) The complex living organisms originated from primitive living organisms.

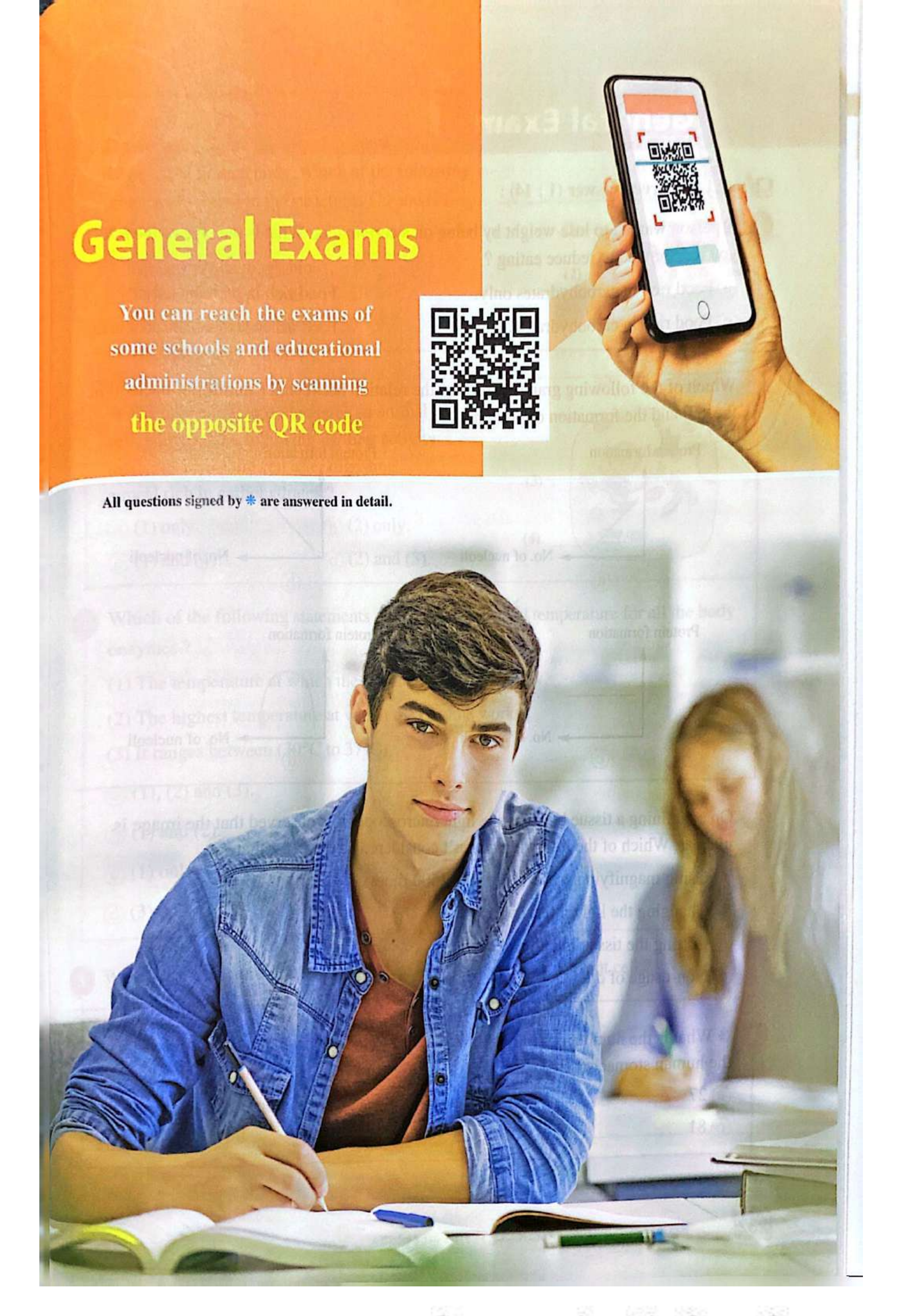
Answer the following questions (8 : 10) :

8 **The cellular division process is the most important vital process in the cell of the living organism :**

What are the changes that occurred in the cell during this process ?

9 **The opposite graph illustrates the relation between two different enzymes (A) and (B) and pH value,** **conclude** the pH value at which the two enzymes (A) and (B) have the maximum activity.

10 **What is the role of :** the cytoplasm in supporting the living cell ?


General Exams
You can reach the exams of some schools and educational administrations by scanning the opposite QR code
All questions signed by * are answered in detail.

General Exam 1

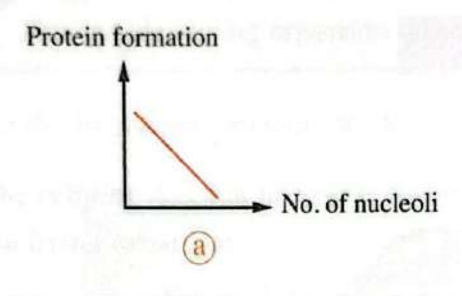


Choose the correct answer (1 : 14) :

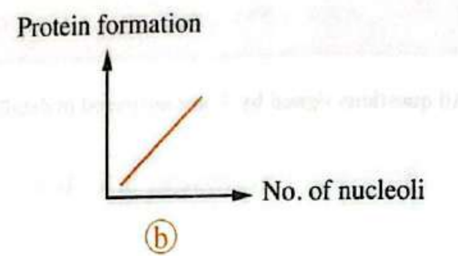
1 A person wanted to lose weight by being on a certain diet. What is the type of food do you recommend to reduce eating ?

ⓐ Food rich in carbohydrates only.
ⓑ Food rich in proteins only.
ⓒ Food rich in carbohydrates and fats.
ⓓ Food rich in proteins and poor in fats.

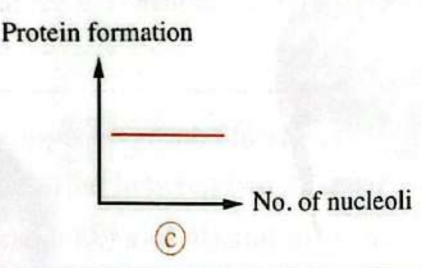
2 Which of the following graphs expresses the relation between the number of nucleoli in the cell and the formation of protein ?



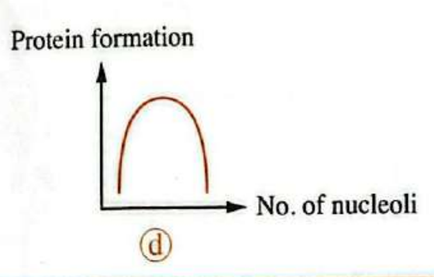
ⓐ



ⓑ



ⓒ



ⓓ

3 On examining a tissue by using the light microscope, it is observed that the image is unclear. Which of the following **doesn't** considered a reason for that ?

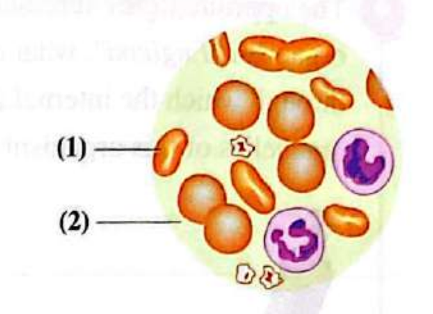
ⓐ Using magnifying power more than 1500 times.
ⓑ Changing the light intensity.
ⓒ Cutting the tissue into thin slices.
ⓓ Non-usage of dyes.

4 * What is the number of microtubules that form the centrosome in three cells from the human stomach ?

ⓐ 27
ⓑ 54
ⓒ 81
ⓓ 162

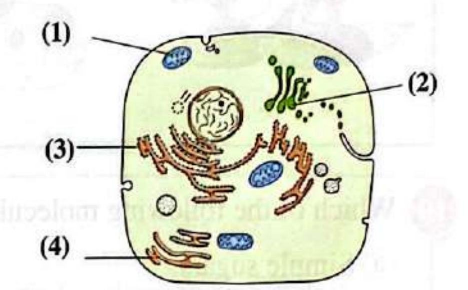


5 The opposite figure illustrates an important tissue in the human body, which of the following proteins are found in the structures (1) and (2) respectively ?



ⓐ Albumin / Haemoglobin.
ⓑ Thyroxine / Chromatin.
ⓒ Chromatin / Thyroxine.
ⓓ Haemoglobin / Albumin.

6 * The opposite figure illustrates an animal cell, which of the following its/their activity increases inside the cell after digesting a meal rich in carbohydrates ?



ⓐ (1) only. ⓑ (2) only.
ⓒ (1) and (4). ⓓ (2) and (3).

7 Which of the following statements expresses the optimal temperature for all the body enzymes ?

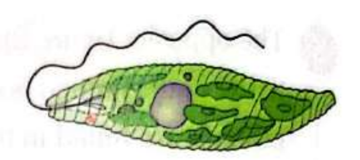
(1) The temperature at which the enzyme works efficiently.
(2) The highest temperature at which the enzyme works.
(3) It ranges between (30°C to 37°C).

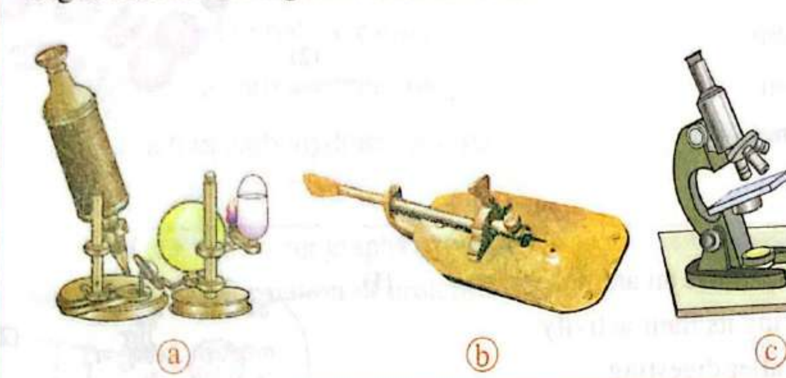
ⓐ (1), (2) and (3).
ⓑ (1) and (2).
ⓒ (1) only.
ⓓ (3) only.

8 What is the structure from which RNA exits to the cytoplasm in plant cell ?

ⓐ Plasma membrane.
ⓑ Cell wall.
ⓒ Nuclear membrane.
ⓓ Sap vacuole membrane.

9 The opposite figure represents a unicellular organism "*Euglena*", what is the microscope through which the internal details for the organelles of this organism can be seen ?







ⓐ ⓑ ⓒ ⓓ

10 Which of the following molecules vary in their chemical composition greatly ?

ⓐ Simple sugars.
ⓑ Lipids.
ⓒ Nucleic acids.
ⓓ Carbohydrates.

11 Marfan syndrome is a disorder resulted from a disturbance in the gene that makes the body produce the protein which helps in providing a body tissue with its elasticity and hardness, which of the following tissues is affected by this syndrome ?

ⓐ Connective tissue.
ⓑ Muscular tissue.
ⓒ Nervous tissue.
ⓓ Epithelial tissue.

12 The opposite graph illustrates the relation between the activity of 3 enzymes (X), (Y) and (Z), and the pH value, which of the following can be concluded ?

ⓐ Each enzyme works efficiently at different pH value from the other.
ⓑ Each enzyme works efficiently in a narrow thermal range.
ⓒ The three enzymes work efficiently in an acidic medium.
ⓓ The three enzymes work efficiently in an alkaline medium.

13. What is the type of muscles that allow chimpanzee animal climb the high trees ?

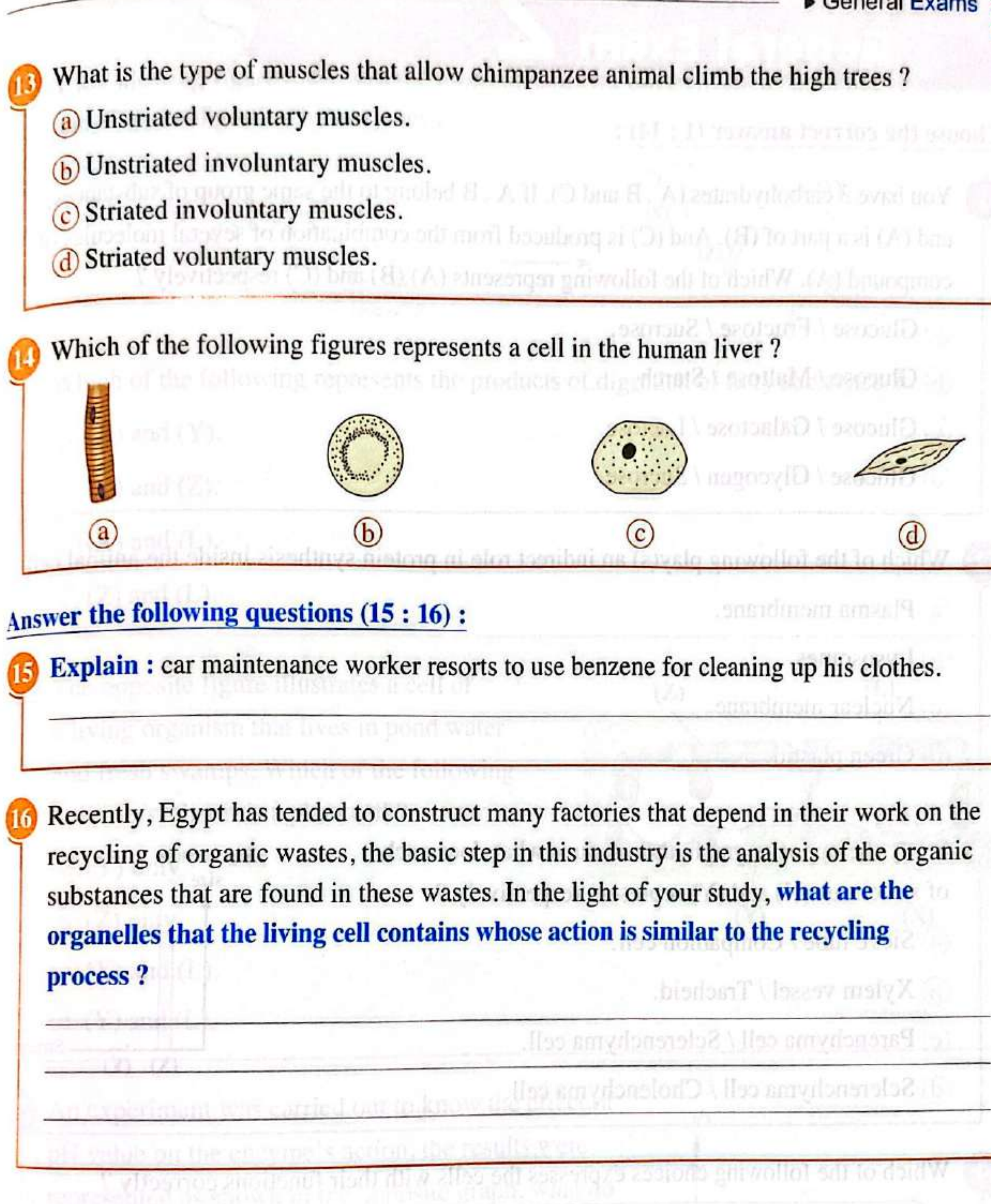
ⓐ Unstriated voluntary muscles.

ⓑ Unstriated involuntary muscles.

ⓒ Striated involuntary muscles.

ⓓ Striated voluntary muscles.

14. Which of the following figures represents a cell in the human liver ?



Answer the following questions (15 : 16) :

15. **Explain :** car maintenance worker resorts to use benzene for cleaning up his clothes.

16. Recently, Egypt has tended to construct many factories that depend in their work on the recycling of organic wastes, the basic step in this industry is the analysis of the organic substances that are found in these wastes. In the light of your study, **what are the organelles that the living cell contains whose action is similar to the recycling process ?**

General Exam 2

Choose the correct answer (1 : 14) :

1. You have 3 carbohydrates (A , B and C). If A , B belong to the same group of substances, and (A) is a part of (B). And (C) is produced from the combination of several molecules of compound (A). Which of the following represents (A),(B) and (C) respectively ?

   (a) Glucose / Fructose / Sucrose.

   (b) Glucose / Maltose / Starch.

   (c) Glucose / Galactose / Lactose.

   (d) Glucose / Glycogen / Sucrose.

2. Which of the following play(s) an indirect role in protein synthesis inside the animal cell ?

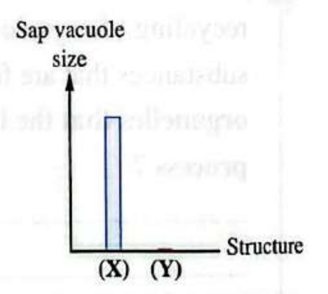
   (a) Plasma membrane.

   (b) Lysosomes.

   (c) Nuclear membrane.

   (d) Green plastid.

3. Study the opposite graph, then deduce what does each of structures (X) and (Y) represent respectively ?



   (a) Sieve tube / Companion cell.

   (b) Xylem vessel / Tracheid.

   (c) Parenchyma cell / Sclerenchyma cell.

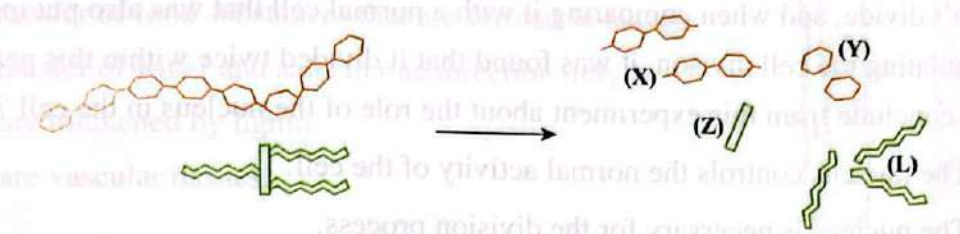
   (d) Sclerenchyma cell / Cholenchyma cell.

4. Which of the following choices expresses the cells with their functions correctly ?

	Storage	Transport and support	Transport of O_2
(a)	Red blood cells	Xylem cells	Parenchyma cells
(b)	Parenchyma cells	Xylem cells	Red blood cells
(c)	Xylem cells	Sclerenchyma cells	Parenchyma cells
(d)	Parenchyma cells	Sclerenchyma cells	Red blood cells



5 The following figure illustrates the molecules of two different food substances before and after the digestion by enzymes :



Which of the following represents the products of digestion of fatty substance ?

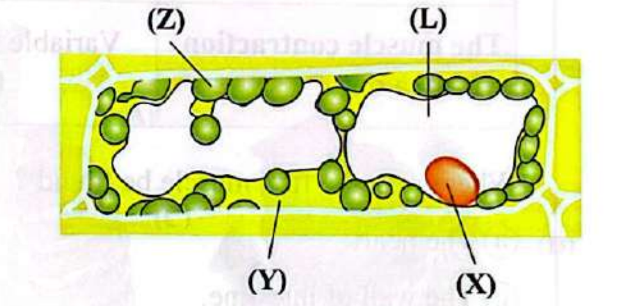
ⓐ (X) and (Y).

ⓑ (Y) and (Z).

ⓒ (X) and (L).

ⓓ (Z) and (L).

6 The opposite figure illustrates a cell of a living organism that lives in pond water and fresh swamps. Which of the following indicate(s) that it is a plant cell ?



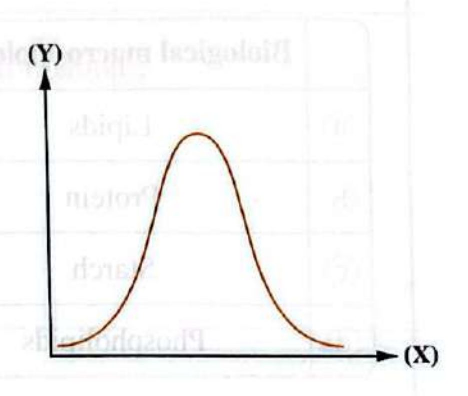
ⓐ (Y) only.

ⓑ (Z) only.

ⓒ (X) and (L).

ⓓ (Y) and (L).

7 An experiment was carried out to know the effect of pH value on the enzyme's action, the results were represented as shown in the opposite graph, what do (X) and (Y) axes represent in this graph ?



	X-axis	Y-axis
ⓐ	pH	Enzyme activity
ⓑ	pH	Time
ⓒ	Enzyme activity	pH
ⓓ	Time	pH

8 * An animal cell whose nucleus was removed, however it was not damaged, then it was placed in a solution stimulating the cell division, it remained alive for a day, but it didn't divide, and when comparing it with a normal cell that was also put in a solution stimulating the cell divison, it was found that it divided twice within this period, what do you conclude from this experiment about the role of the nucleus in the cell ?

ⓐ The nucleus controls the normal activity of the cell.

ⓑ The nucleus is necessary for the division process.

ⓒ The nucleus is necessary for life.

ⓓ The nucleus is the only part in the cell that contains RNA

9 * The following table illustrates the action of two different types of involuntary muscles within a day, study it, then answer :

	First muscle	Second muscle
The muscle contraction within a day :	Variable within the day hours	Continuous within the day hours

Where may the first muscle be found ?

ⓐ The heart.

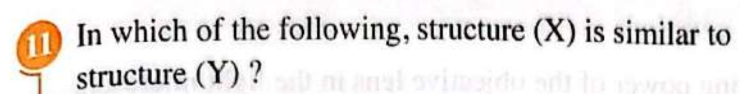
ⓑ The leg.

ⓒ The wall of intestine.

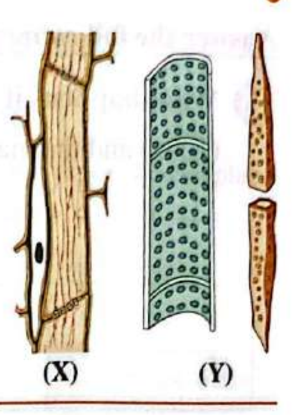
ⓓ The mesentery.

10 Which of the following represents the elements and basic units that entered in the building of the biological macro-molecules ?

	Biological macro-molecules	Elements	Basic units
ⓐ	Lipids	Carbon, hydrogen, oxygen and nitrogen	Amino acid
ⓑ	Protein	Carbon, hydrogen, oxygen and nitrogen	Fatty acid
ⓒ	Starch	Carbon, hydrogen and oxygen	Glucose
ⓓ	Phospholipids	Carbon, hydrogen and oxygen	Fatty acid



11 In which of the following, structure (X) is similar to structure (Y) ?

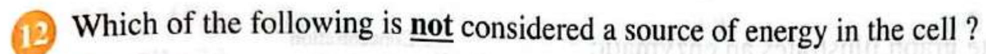


ⓐ The transfer of food substances that are formed in leaves.

ⓑ The transfer of water and salts in one direction only.

ⓒ Both are thickened by lignin.

ⓓ Both are vascular tissues.



12 Which of the following is **not** considered a source of energy in the cell ?

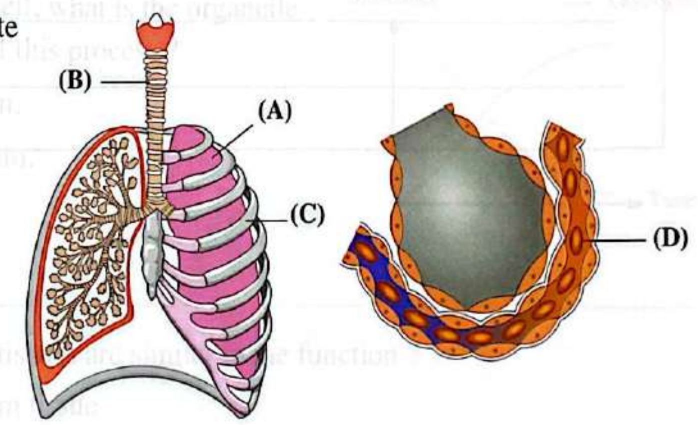
ⓐ Glucose.

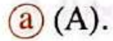
ⓑ Lactose.

ⓒ Insulin.

ⓓ Starch.

13 The two opposite figures illustrate the respiratory system in human and an alveolus surrounded by blood capillaries, which of the following represents a cell ?





ⓐ (A).

ⓑ (B).

ⓒ (C).

ⓓ (D).

14 Which of the following structures contains the genetic information ?

ⓐ Plasma membrane of a plant cell.

ⓑ Cytoplasm of an animal cell.

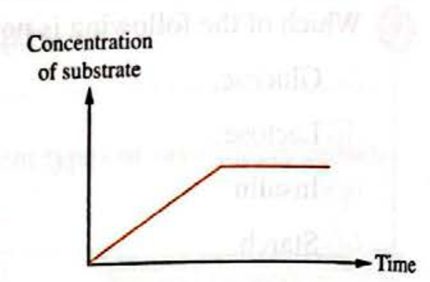
ⓒ Nucleus of a plant cell.

ⓓ Lysosome in an animal cell.

Answer the following questions (15 : 16) :

15 **What happens if :** the magnifying power of the objective lens in the light microscope is (100x) and the magnifying power of the ocular lens is (20x) ?

16 The opposite graph illustrates an enzymatic reaction. **How far** is this graph correct ?
With explanation.

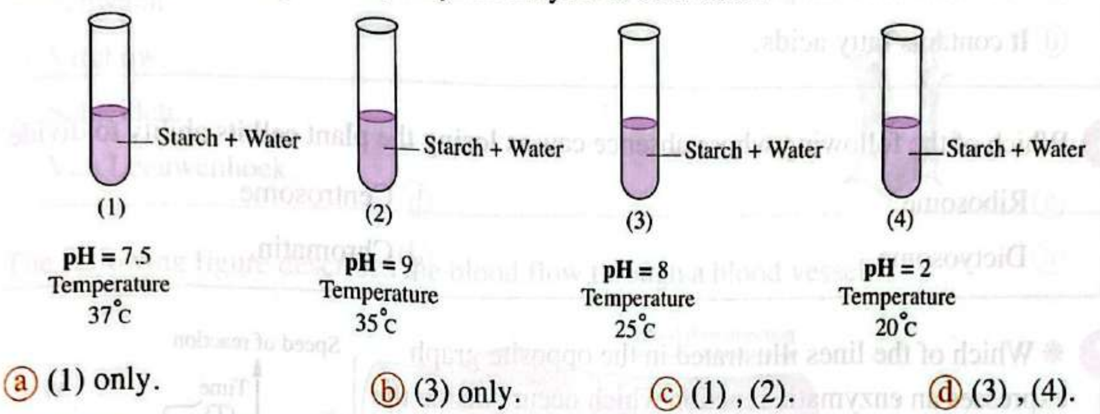


General Exam 3



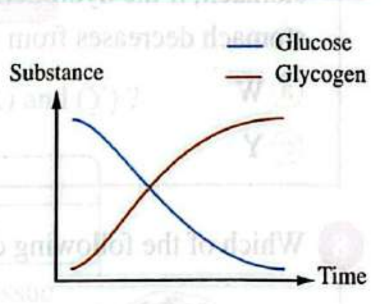
Choose the correct answer (1 : 14) :

1. From the following figures, in which of the following tubes the digestion process takes place efficiently, after adding salivary amylase enzyme to each tube ?



ⓐ (1) only. ⓑ (3) only. ⓒ (1) , (2). ⓓ (3) , (4).

2. From the opposite graph which illustrates a vital process that takes place in a part of the cell, what is the organelle responsible for the occurrence of this process ?

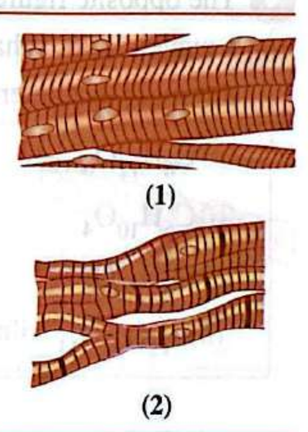


ⓐ Rough endoplasmic reticulum.
ⓑ Smooth endoplasmic reticulum.
ⓒ Mitochondrion.
ⓓ Ribosome.

3. * Which of the following plant tissues are similar in the function ?

ⓐ Parenchyma tissue and phloem tissue.
ⓑ Xylem tissue and parenchyma tissue.
ⓒ Collenchyma tissue and sclerenchyma tissue.
ⓓ Phloem tissue and sclerenchyma tissue.

4. The two opposite figures illustrate two tissues in the human body, in which of the following each of (1) and (2) is found respectively ?



ⓐ Wall of alimentary canal / Trunk muscles.
ⓑ Wall of urinary bladder / Artery wall.
ⓒ Vein wall / Alveolus wall.
ⓓ Hands muscles / Heart wall.

5 What is the reason for the ability of wax covering the plant leaves to decrease the water loss ?

ⓐ It contains monohydric alcohols.

ⓑ It is from the organic compounds.

ⓒ It is from the biological macro-molecules.

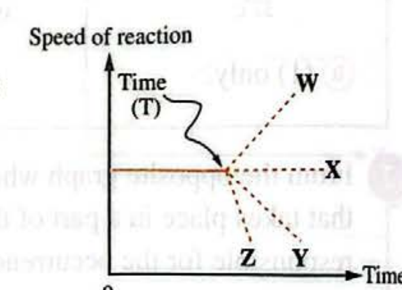
ⓓ It contains fatty acids.

6 Which of the following whose absence causes losing the plant cell its ability to divide ?

ⓐ Ribosome. ⓑ Centrosome.

ⓒ Dictyosome. ⓓ Chromatin.

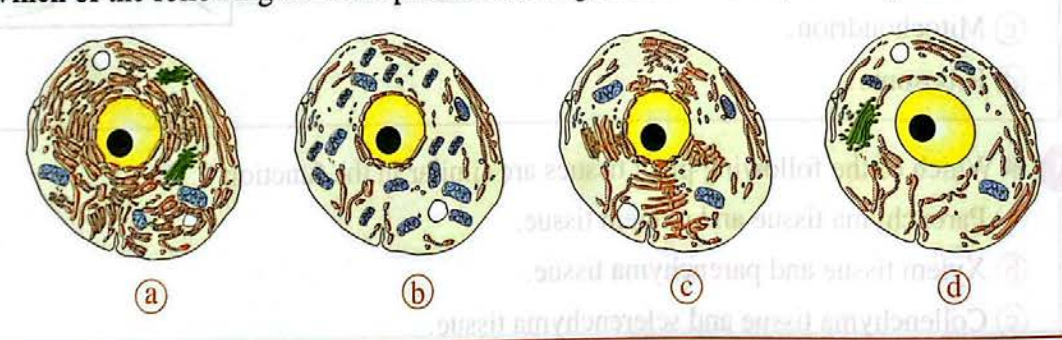
7 * Which of the lines illustrated in the opposite graph expresses an enzymatic reaction which occurs inside the stomach, if the hydrogen ion concentration (pH) of the stomach decreases from 4 to 2 at time (T) ?



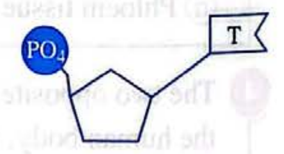
ⓐ W ⓑ X

ⓒ Y ⓓ Z

8 Which of the following cells can produce the largest amount of lipase enzyme ?



9 The opposite figure illustrates a nucleotide in a nucleic acid. What is the chemical formula of the sugar that enters in the structure of this nucleotide ?



ⓐ $C_6H_{12}O_6$

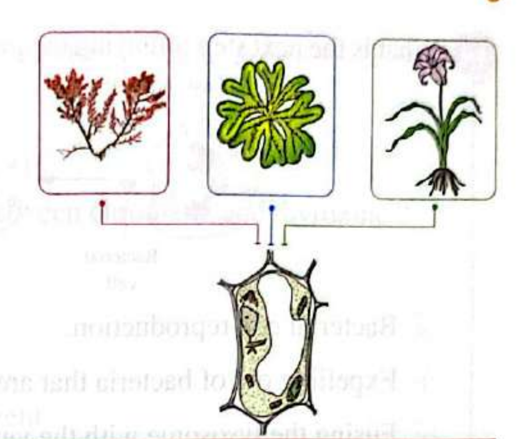
ⓑ $C_5H_{10}O_4$

ⓒ $C_5H_{10}O_5$

ⓓ $C_{12}H_{22}O_{11}$



10 The opposite figures illustrate one of the principles upon which the cell theory depends, who is the scientist stated this principle ?



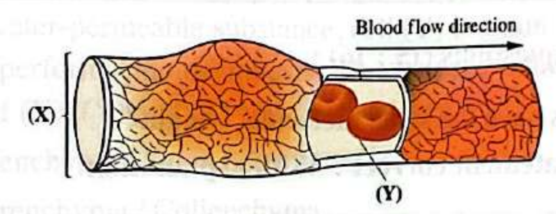
ⓐ Schwann.

ⓑ Virchow.

ⓒ Schleiden.

ⓓ Van Leeuwenhoek.

11 The following figure describes the blood flow through a blood vessel :



Which of the following illustrates the structure of each of (X) and (Y) ?

	(X)	(Y)
ⓐ	Simple tissue	Cell
ⓑ	Cell	Simple tissue
ⓒ	Organ	Cell
ⓓ	Organ	Simple tissue

12 Which of the following statements is correct about the unsaturated fats ?

ⓐ They are more common in animals than plants.

ⓑ They are more common in plants than animals.

ⓒ They are solid at the room temperature.

ⓓ Monohydric alcohols enter in their structure.

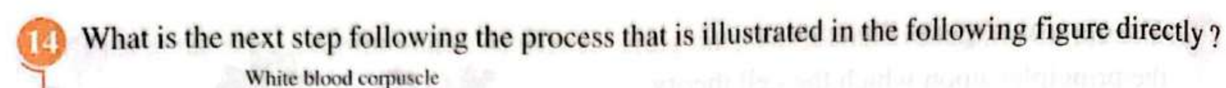
13 Which of the following may represent the location of the cells that are illustrated in the opposite figure ?

ⓐ Lining of small intestine.

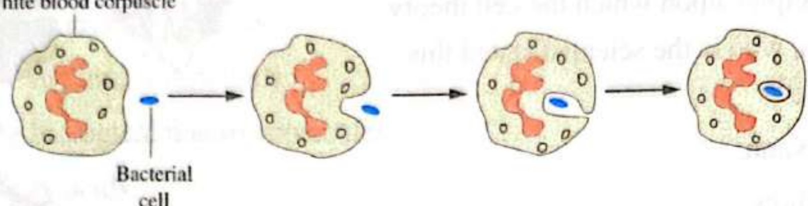
ⓑ Blood.

ⓒ Lining of the kidney tubules.

ⓓ Stomach wall.



14 What is the next step following the process that is illustrated in the following figure directly ?



ⓐ Bacterial cell reproduction.

ⓑ Expelling out of bacteria that are engulfed outside the cell.

ⓒ Fusing the lysosome with the vesicle containing bacteria.

ⓓ Fusing the vesicle containing bacteria with the cell membrane.

Answer the following questions (15 : 16) :

15 "Monosaccharides have the same molecular weight".
How far is this statement correct ? With explanation.

16 **What is the role of :** plastids in the formation of carbohydrates inside the plant cell ?

General Exam 4



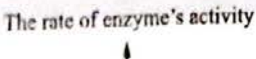
Choose the correct answer (1 : 14) :

1. Which of the following represents a similarity between chromatin and thyroxine ?
   (a) Both have the same chemical structure.
   (b) Both are from the simple proteins.
   (c) Both are from the conjugated proteins.
   (d) Both give positive result with Benedict's reagent.

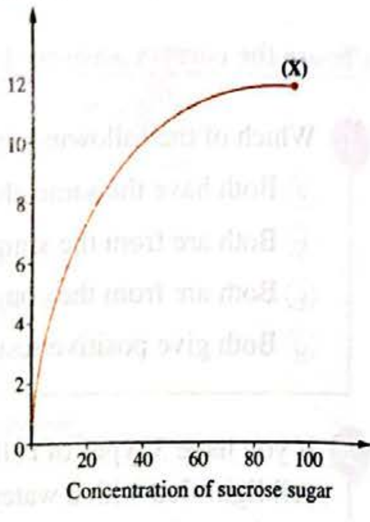
2. If you have 3 types of cells that belong to simple plant tissues, where cell (X) is a living cell liginified with a water-permeable substance, cell (Y) is a non living cell and cell (Z) has thin cell wall and performs photosynthesis. Which of the following represents the correct arrangement of (X), (Y) and (Z) cells respectively ?
   (a) Parenchyma / Collenchyma / Sclerenchyma.
   (b) Sclerenchyma / Parenchyma / Collenchyma.
   (c) Collenchyma / Sclerenchyma / Parenchyma.
   (d) Parenchyma / Companion cell / Tracheid.

3. Liver is called "Toxins store" in the human body, because its cells contain a large percentage of ....
   (a) ribosomes.
   (b) rough endoplasmic reticulum.
   (c) mitochondria.
   (d) smooth endoplasmic reticulum.

4. If you know that "Caudal Regression Syndrome" is a rare disorder that affects the embryo as a result of gene mutation, leading to deformations in the growth of lower limbs of the embryo's body before delivery. Where do you expect this disorder occurrence ?
   (a) Nucleus.
   (b) Mitochondria.
   (c) Centrosome.
   (d) Lysosomes.



5 * From the opposite graph that illustrates the relation between the rate of activity of sucrase enzyme and the concentration of sucrose sugar. Which of the following is the reason for the constant activity of the enzyme at point (X)?



ⓐ The enzyme's activity is inhibited.
ⓑ The substrate is consumed completely.
ⓒ The enzyme's concentration limits the rate of the chemical reaction.
ⓓ The substrate's concentration limits the rate of the chemical reaction.

6 * Which of the following can be seen when staining a plant cell and examining it under a microscope with magnifying power (400x) ?

	Endoplasmic reticulum	Mitochondria	Chromosomes	Cell wall
ⓐ	✓	✗	✓	✓
ⓑ	✗	✗	✓	✓
ⓒ	✗	✓	✓	✗
ⓓ	✓	✓	✗	✗

7 A digestive enzyme in human digests its substrate rapidly at temperature (37°C), what happens if the enzyme and its substrate are placed in a medium with temperature (50°C) ?
ⓐ The reaction won't occur.
ⓑ The reaction continues with the same rate.
ⓒ The reaction occurs with a rapid rate.
ⓓ The reaction occurs with a slow rate.

8 * In human blood, there are several types of white blood cells that can engulf, disintegrate and get rid of the microbes, while most of the plant cells can't do this, due to the presence of ....
ⓐ cell membrane.
ⓑ Golgi apparatus.
ⓒ chloroplasts.
ⓓ cell wall.

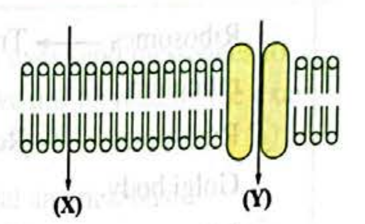
9 Which of the following organic molecules contain free carboxyl groups on their hydrolysis ?

ⓐ Polysaccharides only.
ⓑ Proteins only.
ⓒ Phospholipids and polysaccharides.
ⓓ Phospholipids and proteins.

10 Which of the following whose presence is common in each of the plant cell and animal cell ?

ⓐ The plasma membrane and cell wall.
ⓑ Cell wall and ribosomes.
ⓒ Plasma membrane, cell wall and DNA
ⓓ Plasma membrane, DNA and ribosomes.

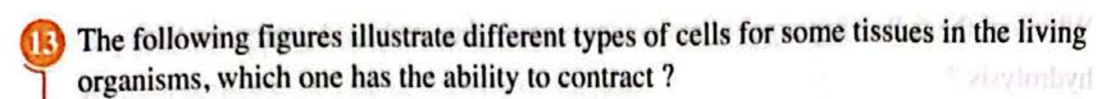
11 * The opposite diagrammatic figure illustrates a part of the plasma membrane. Which of the following shows the correct pathway for the transport of glucose and water through the plasma membrane ?



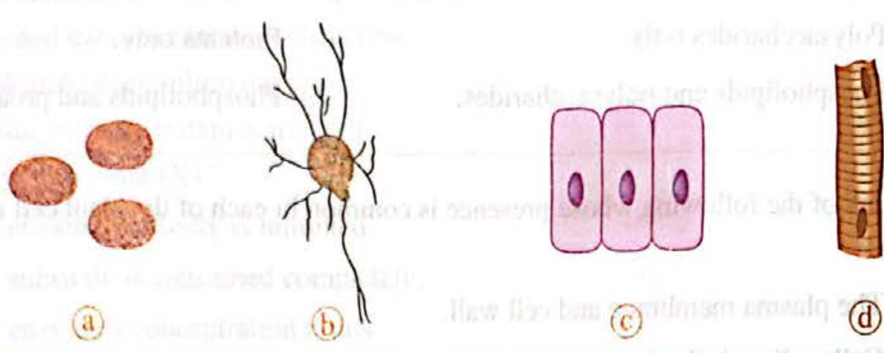
	Glucose	Water
ⓐ	(Y) only	(X) & (Y)
ⓑ	(Y) only	(X) only
ⓒ	(X) & (Y)	(X)
ⓓ	(X) only	(X) & (Y)

12 Which of the following substances give a positive result with Sudan-4 reagent ?

ⓐ All the substances that contain monosaccharides.
ⓑ All the organic substances.
ⓒ All the substances that contain fatty acids.
ⓓ All the substances that consist of amino acids.



13 The following figures illustrate different types of cells for some tissues in the living organisms, which one has the ability to contract ?



(a) (b) (c) (d)

14 Which of the following illustrates the correct pathway for the production of a certain enzyme ?

(a) Ribosomes ⟶ Golgi body ⟶ Transporting vesicles ⟶ Rough endoplasmic reticulum.

(b) Ribosomes ⟶ Transporting vesicles ⟶ Golgi body ⟶ Rough endoplasmic reticulum.

(c) Ribosomes ⟶ Rough endoplasmic reticulum ⟶ Transporting vesicles ⟶ Golgi body.

(d) Ribosomes ⟶ Rough endoplasmic reticulum ⟶ Golgi body ⟶ Transporting vesicles.

Answer the following questions (15 : 16) :

15 Indian fox and polar fox are from the same genus, but each one of them lives in its own environment and can't live in the other's environment. **In the light of your study, why doesn't the indian fox have the ability to live in the north pole ?**

16 **What is the relation between :** the magnifying power of the microscope and the wavelengths ?

General Exam 5



Choose the correct answer (1 : 14) :

1 What is the number of free amino groups in a polypeptide chain which is composed of 20 amino acids ?

ⓐ 1 ⓑ 10 ⓒ 19 ⓓ 20

2 What is the similarity between the fatty acid and the nucleotide ?

ⓐ Both enter in the structure of plasma membrane.
ⓑ Both are from organic compounds.
ⓒ Both are from inorganic compounds.
ⓓ Both are from polymers.

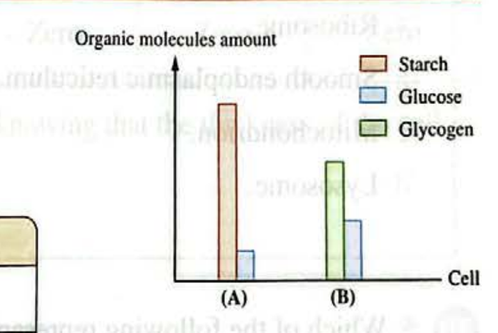
3 At the time of reading the exam questions, certain cells in the eyes send messeages to brain cells to give order for another cells to allow eyes to move during reading the exam papers. Which of the following represent these cells respectively ?

ⓐ Muscular and nervous. ⓑ Epithelial and nervous.
ⓒ Nervous and muscular. ⓓ Connective and nervous.

4 Who is the scientist that reached the scientific base that explains the regeneration of liver tissue when trasplanting it in a pateint suffering from liver fibrosis ?

ⓐ Schleiden. ⓑ Virchow. ⓒ Schwann. ⓓ Robert Hooke.

5 The opposite graph illustrates energy-storing organic molecules in two cells (A) and (B), which of the following expresses this graph accurately ?



	Cell (A)	Cell (B)
ⓐ	A cell in a plant leaf	Nervous cell
ⓑ	Muscular cell	Hepatic cell
ⓒ	Muscular cell	A cell in a plant leaf
ⓓ	A cell in a plant leaf	Muscular cell

 Which of the following can be seen by the light microscope ?

ⓐ Virus.

ⓑ Red blood cell.

ⓒ Golgi apparatus.

ⓓ Internal structure of the chloroplast.

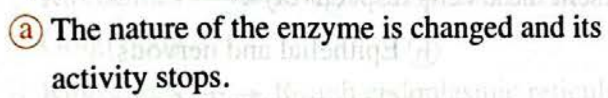
 * In which of the following plasma membrane is similar to the nuclear membrane ?

ⓐ Both are affected by lipids solvents.

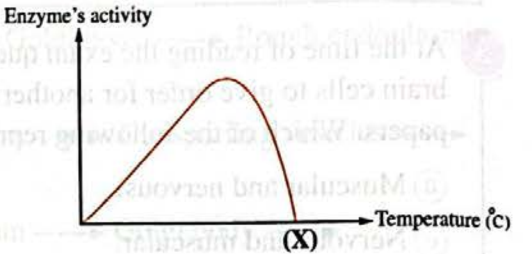
ⓑ Both are characterized by the selective permeability.

ⓒ Both have gates.

ⓓ Both separate between the cell contents and the surrounding medium.



8 * The opposite graph illustrates the effect of temperature on the activity of an enzyme, what happened at point (X) ?



ⓐ The nature of the enzyme is changed and its activity stops.

ⓑ The enzyme is consumed.

ⓒ The substrate is consumed.

ⓓ The presence of an enzyme inhibitor.

 What is the most acting organelle during practicing physical exercises ?

ⓐ Ribosome.

ⓑ Smooth endoplasmic reticulum.

ⓒ Mitochondrion.

ⓓ Lysosome.

10 * Which of the following represent living and non-living structures respectively in the xylem tissue ?

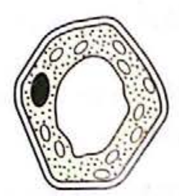
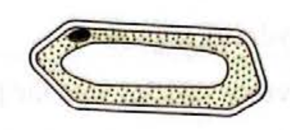
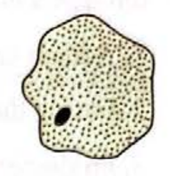
ⓐ Vessels / Tracheids.

ⓑ Tracheids / Parenchyma cells.

ⓒ Parenchyma cells / Vessels.

ⓓ Vessels / Parenchyma cells.

11 Which of the following choices is/are present in all the illustrated cells ?

ⓐ Cell membrane. ⓑ Cell wall. ⓒ Plastids. ⓓ Nucleus.

12 The components of four different types of food were tested and the results recorded in the following table, which type of food contains monosaccharide, starch and protein respectively ?

	Benedict's test	Iodine test	Biuret's test
ⓐ	Blue	Orange	Violet
ⓑ	Orange	Blue	Violet
ⓒ	Orange	Orange	Blue
ⓓ	Blue	Blue	Blue

13 * Study the following table, then determine :

	Cell no. (1)	Cell no. (2)	Cell no. (3)	Cell no. (4)
Amount of cellulose in the cell wall :	100 nm	Zero	200 nm	100 nm
Amount of the other substances in the cell wall :	80 nm	Zero	Zero	Zero

Which cell belongs to the parenchyma tissue ? "knowing that the thickness of the cell wall without any sediments equals = 100 nm".

ⓐ Cell no. (1).

ⓑ Cell no. (2).

ⓒ Cell no. (3).

ⓓ Cell no. (4).



14 * The cells that line the trachea secrete a mucous substance, and this process passed through a number of stages, as follows :

1. Adding carbohydrates to protein.
2. Fusing the secretory vesicles with the plasma membrane.
3. Production of the protein by ribosomes.
4. Separation of the vesicles from Golgi apparatus.

What is the correct arrangement for these stages ?

ⓐ (1) → (4) → (2) → (3).
ⓑ (1) → (4) → (3) → (2).
ⓒ (3) → (1) → (2) → (4).
ⓓ (3) → (1) → (4) → (2).

Answer the following questions (15 : 16) :



15 **What is the difference between :** chromatid and chromatin ?

16 **In the light of your study, What** are the elements that may be found in proteins but **not** found in carbohydrates ?

General Exam 6



Choose the correct answer (1 : 14) :

1. In which of the following the nucleotides that enter in DNA structure differ from that enter in RNA structure ?

   ⓐ Type of sugar. ⓑ Number of phosphate groups.
   ⓒ Type of chemical bonds. ⓓ Number of carbon atoms.

2. Which of the following organelles **doesn't / don't** participate in the production of insulin protein in the human body ?

   ⓐ Ribosomes. ⓑ Rough endoplasmic reticulum.
   ⓒ Golgi bodies. ⓓ Smooth endoplasmic reticulum.

3. Which of the following belongs to the cell theory ?

   ⓐ All the cells contain proteins. ⓑ Most cells can perform cell division.
   ⓒ All the cells contain nucleic acids. ⓓ Some cells can move.

4. Which of the following plant tissues may be known as a multifunctional tissue ?

   ⓐ Parenchyma. ⓑ Xylem. ⓒ Sclerenchyma. ⓓ Phloem.

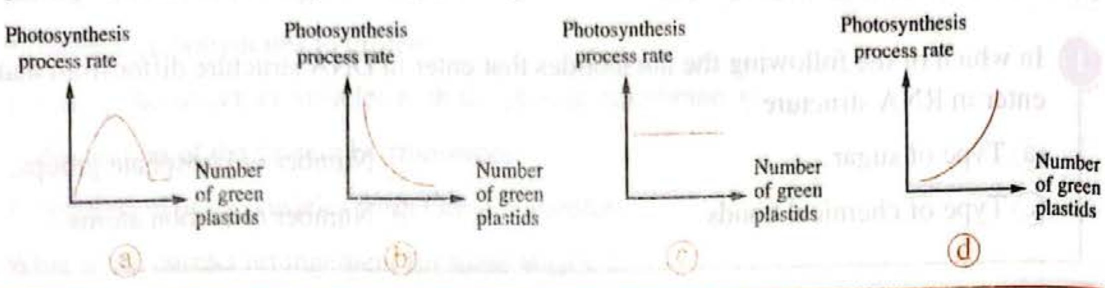
5. The general formula of monosaccharides is $(CH_2O)_n$ and the chemical formula of glucose sugar is $C_6H_{12}O_6$, which of the following may refer to letter (n) ?

   ⓐ The number of hydrogen atoms exist in sugar.
   ⓑ The number of carbon atoms that enter in the structure of sugar.
   ⓒ The number of chemical bonds among the atoms of elements.
   ⓓ The number of (OH) groups that linked to carbon atoms.

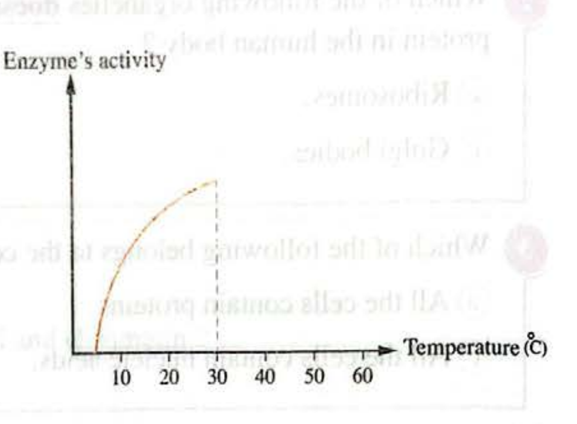
6. The electron microscope is characterized by forming more accurate images than that of the light microscope, which of the following is considered the application for this characteristic feature ?

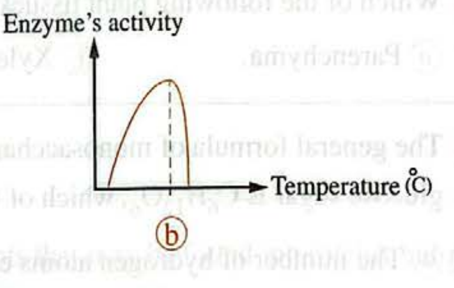
   ⓐ Obtaining a bigger image for the tissue cells.
   ⓑ The ability of seeing the cristae in the mitochondria.
   ⓒ The ability of seeing the cell wall of a plant cell.
   ⓓ The ability of seeing the nucleus in *Amoeba*.

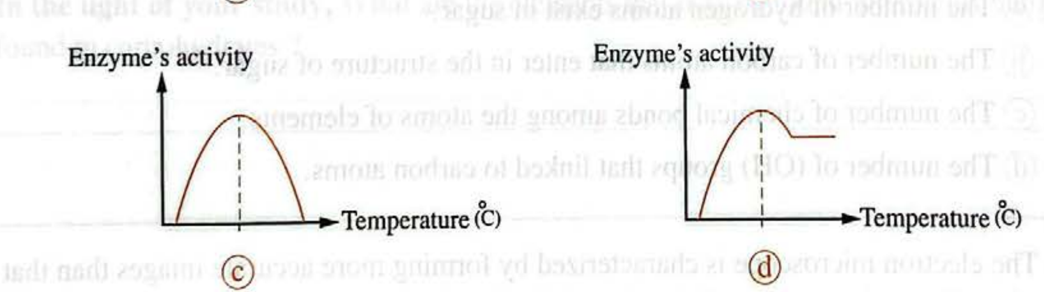
7. Which of the following graphs expresses the relation between the number of green plastids and the efficiency of the plant to perform the photosynthesis process ?



8. ✱ In an experiment to study the effect of temperature on the activity of an enzyme in the body, a student added this enzyme to the substrate, providing the suitable conditions for its action, then he recorded the results as shown in the opposite graph, which graph may be obtained if the student elevates the temperature up to 60°C suddenly ?



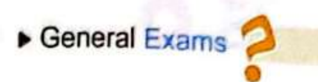




Enzyme's activity — Temperature (°C) ⓐ

9. ✱ A researcher removed a component from an animal cell during carrying out one of his experiments, this leads to stopping all the vital processes in the cell after several hours. What do you expect this component to be ?

ⓐ Nucleus.
ⓑ Endoplasmic reticulum.
ⓒ Lysosome.
ⓓ Golgi apparatus.



10 Which of the following are found in abundance in the thyroid gland cells to produce thyroxine hormone ?

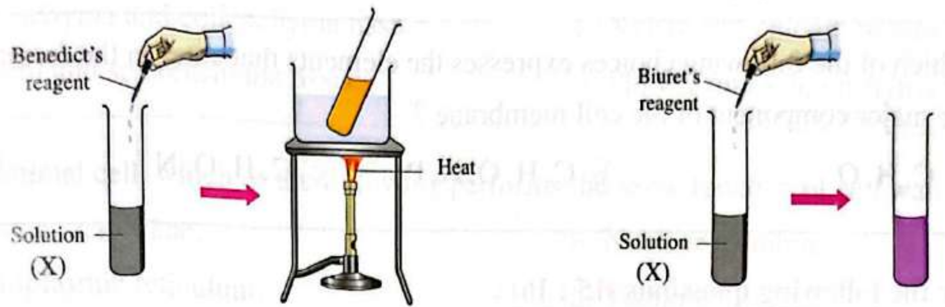
(a) Nucleoli and Golgi bodies.

(b) Vacuoles and rough endoplasmic reticulum.

(c) Smooth endoplasmic reticulum and ribosomes.

(d) Secretory vesicles and smooth endoplasmic reticulum.

11 The following figures represent two tests carried out on solution (X) :



Which of the following represent the organic substances that will be indicated in this solution ?

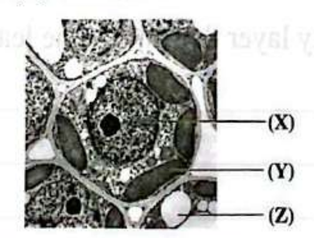
(a) Protein and starch.

(b) Glucose and protein.

(c) Sucrose and fats.

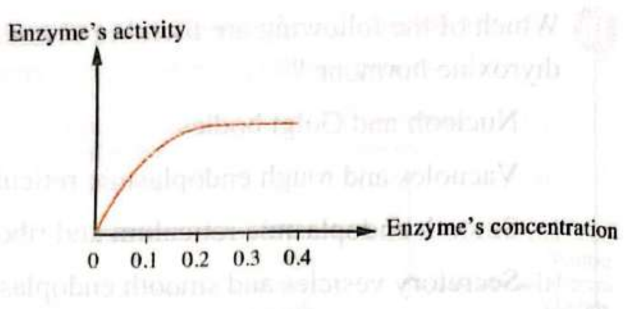
(d) Starch and glucose.

12 The following figure represents a plant cell that appears under the electron microscope, what do organelles (X), (Y) and (Z) contain ?



	(X)	(Y)	(Z)
(a)	Water	Chlorophyll	Protein
(b)	Mineral ions	Starch	DNA and RNA
(c)	Water	Mineral ions	Starch
(d)	DNA and RNA	Starch	Mineral ions

13 * The opposite graph illustrates the relation between the activity of a certain enzyme and its concentration in the reaction medium. At which concentration of enzyme, it is expected obtaining the highest concentration of reaction products ?



ⓐ 0.1 ⓑ 0.2 ⓒ 0.3 ⓓ 0.4

14 Which of the following choices expresses the elements that enter in the formation of the major component of the cell membrane ?

ⓐ C, H, O ⓑ C, H, O, N, P ⓒ C, H, O, N ⓓ C, H, O, P

Answer the following questions (15 : 16) :

15 Each of the nucleus and mitochondrion is surrounded by a double membrane, but each one has its nature that helps in performing the vital processes of the cell. **Explain this.**

16 **What happens if :** the waxy layer that covers the leaves of cactus plant is absent ?

General Exam 7



Choose the correct answer (1 : 14) :

1. Which of the following chemical formulae expresses an amino acid ?
   ⓐ CH_3COOH ⓑ CH_3NH_2 ⓒ NH_2CH_2COOH ⓓ CH_4

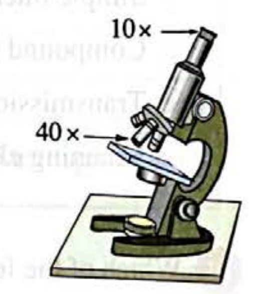
2. Some plants live completely immersed in water as *Elodea* plant, which of the following tissues are rare in this plant, in order to adapt with the aquatic environment ?
   ⓐ Parenchyma and collenchyma tissues. ⓑ Xylem and phloem tissues.
   ⓒ Xylem and sclerenchyma tissues. ⓓ Phloem and sclerenchyma tissues.

3. In the animal cell, which of the following performs the same function of cell wall ?
   ⓐ Plasma membrane. ⓑ Nuclear membrane.
   ⓒ Endoplasmic reticulum. ⓓ Vacuole.

4. If you know that the ligaments link the bones with each other, what is the type of tissue from which the ligaments are formed ?
   ⓐ Epithelial. ⓑ Muscular. ⓒ Connective. ⓓ Nervous.

5. * On chewing a piece of bread for few seconds, we found that its taste is sweet. From the previous, we can conclude that the saliva in mouth contains an enzyme that hydrolyzes ....
   ⓐ starch to glycogen.
   ⓑ glycogen to starch.
   ⓒ starch to cellulose.
   ⓓ starch to maltose.

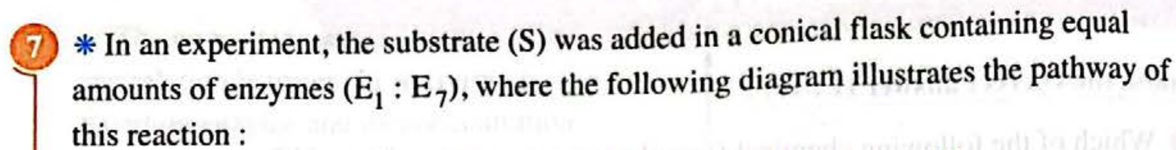
6. The opposite figure illustrates the light microscope, what is the magnifying power of this microscope ?





   ⓐ 40x
   ⓑ 100x
   ⓒ 400x
   ⓓ 4000x

7 * In an experiment, the substrate (S) was added in a conical flask containing equal amounts of enzymes (E_1 : E_7), where the following diagram illustrates the pathway of this reaction :



After 15 minutes from the beginning of the reaction, an inhibitor was added for enzyme (E_3) and the reaction was left till its end, which result do you expect to happen ?

ⓐ Decreasing the production rate of substance (U).
ⓑ Increasing the production rate of substance (Z).
ⓒ The production rate of substance (Y) isn't affected.
ⓓ Increasing the production rate of substance (V).

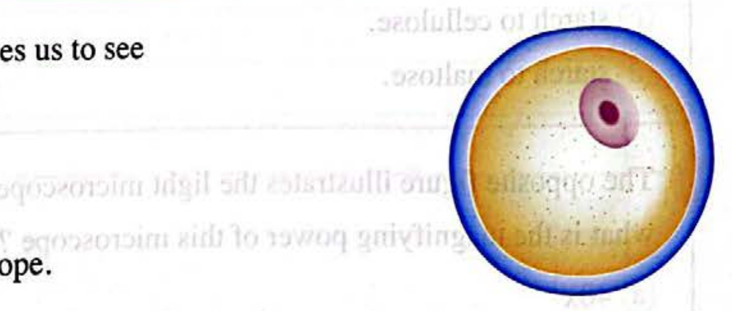
8 Asbestos is considered from the construction materials, and it is a carcinogenic substance. So, many workers suffer from lung fibrosis as a result of inhaling this substance as their bodies cells can't get rid of it, which of the following organelles fail(s) to get rid of this substance ?

ⓐ Vacuoles. ⓑ Lysosomes.
ⓒ Rough endoplasmic reticulum. ⓓ Golgi bodies.

9 Which of the following nitrogenous bases **won't** bind with a sugar with the molecular formula $C_5H_{10}O_4$?

ⓐ Uracil. ⓑ Thymine. ⓒ Adenine. ⓓ Cytosine.

10 What is the microscope that enables us to see the cell as in the opposite figure ?



ⓐ Simple microscope.
ⓑ Compound light microscope.
ⓒ Transmission electron microscope.
ⓓ Scanning electron microscope.

11 Which of the following is/are found in both companion cells and parenchyma cells ?

ⓐ Plastids. ⓑ Centrosome. ⓒ Protoplasm. ⓓ Lignin.

12 Which of the following represents the correct arrangement for the components of a multicellular living organism from the simplest to the most complex ?

a) Cells / Polymers / Organelles / Tissues.

b) Polymers / Cells / Organelles / Tissues.

c) Organelles / Polymers / Cells / Tissues.

d) Polymers / Organelles / Cells / Tissues.

13 Which of the following represents an organ ?

a) b) c) d)

14 Which of the following molecules <u>don't</u> move freely through the phospholipids of the plasma membrane ?

a) Water molecules only.
b) Protein molecules only.
c) Water molecules and oxygen.
d) Protein molecules and oxygen.

Answer the following questions (15 : 16) :

15 **From the following diagram :**

Compound (X) + **Compound (Y)** ⟶ **Compound (Z)**

If (Z) is a compound present in the body of penguin and helps it in keeping its temperature in the severe cold regions. **Conclude what each of the biological compounds (X) and (Y) represents.**

____

16 **What is the relationship between :** photosynthesis process and cellular respiration in the plant ?

____

____

General Exam 8



Choose the correct answer (1 : 14) :

1. Which of the following is a similarity between the tissue that lines the blood capillaries and the tissue that lines the stomach ?
   (a) Both are simple epithelial tissues.
   (b) Both are compound epithelial tissues.
   (c) Both are muscular tissues.
   (d) Both are connective tissues.

2. From the following diagram :



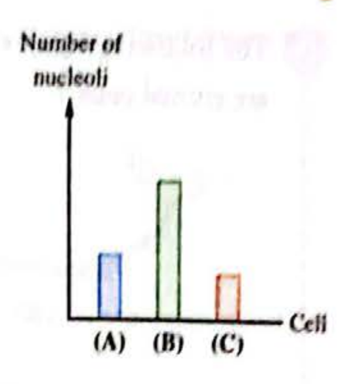
   If (X) is a sugar that is produced from the photosynthesis process and (Z) is found in the milk. What does each of (X) , (Y) and (Z) represent respectively ?
   (a) Fructose / Glucose / Sucrose.
   (b) Glucose / Fructose / Sucrose.
   (c) Glucose / Galactose / Lactose.
   (d) Galactose / Glucose / Maltose.

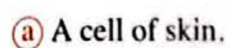
3. Which of the following organelles do you expect its/their presence abundantly in the birds' muscular cells ?
   (a) Endoplasmic reticulum. (b) Mitochondria. (c) Lysosomes. (d) Ribosomes.

4. Which of the following cell organelles is/are more obvious on examining by the light microscope ?
   (a) Ribosomes. (b) Golgi bodies. (c) Lysosomes. (d) Nucleus.

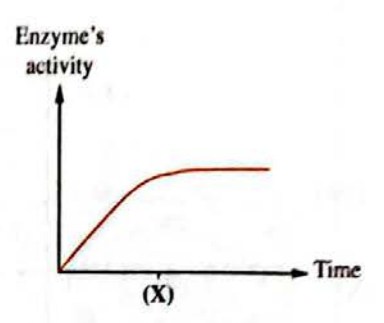
5. Which of the following represent the main units for the postponed-energy substances in the body ?
   (a) Disaccharides.
   (b) Polysaccharides.
   (c) Amino acids.
   (d) Fatty acids.

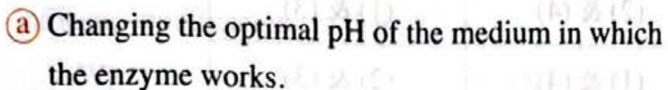
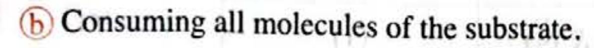
6 * The opposite graph represents the number of nucleoli of three different animal cells. Which of the following represents cell (B) ?




ⓐ A cell of skin.
ⓑ A cell of stomach.
ⓒ A cell of leg bones.
ⓓ A cell of the muscles.

7 From the opposite graph that illustrates the rate of an enzyme activity that is extracted from the human digestive canal, what is the reason for the stability (non-increase) in the enzyme's activity after point (X) ?




ⓐ Changing the optimal pH of the medium in which the enzyme works.

ⓑ Consuming all molecules of the substrate.
ⓒ The enzyme concentration limits the reaction rate.
ⓓ Reaching the temperature degree 55°C

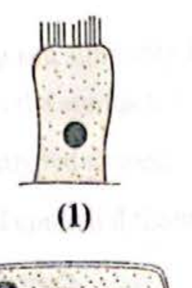
8 * "The living cell needs some mineral ions as calcium". Through which of the following will the calcium ions pass into the cell ?

ⓐ The heads of phospholipids.
ⓑ The tails of phospholipids.
ⓒ Cholesterol molecules.
ⓓ Protein molecules.

9 On placing a living cell of the human liver in a nutritive medium containing a radioactive phosphorus isotope (^{32}P), which of the following molecules in the cell well contain this radioactive isotope ?

ⓐ Glycogen.
ⓑ Albumin protein.
ⓒ DNA
ⓓ Glucose.

10 The following figures illustrate 4 cells, which of the following are plant cells and which are animal cells ?


(1)


(2)


(3)


(4)

	Animal cells	Plant cells
ⓐ	(1), (3) & (4)	(2)
ⓑ	(2) & (4)	(1) & (3)
ⓒ	(1) & (4)	(2) & (3)
ⓓ	(2), (3) & (4)	(1)

11 A student examined a transverse section in a herbaceous plant stem, he found that it contained a tissue whose cells are rectangular in shape, thickened by cellulose substance and contains chloroplasts, according to the student's observation, what is the function of this tissue ?

ⓐ Supporting the plant and storing starch.

ⓑ Supporting the plant and performing photosynthesis process.

ⓒ The aeration and storing starch.

ⓓ The aeration and performing photosynthesis process.

12 * Which of the following represents the chemical compound in the opposite figure ?

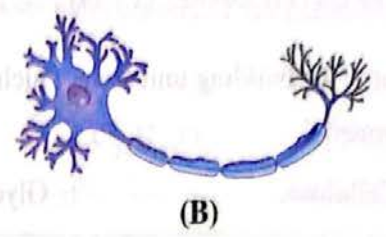
$HOCH_2$ — O — CH_2OH (ring: C, C / H, H, HO, OH / C — C / OH, H)

ⓐ Amino acid.
ⓑ Monosaccharide.
ⓒ Disaccharide.
ⓓ Fatty acid.



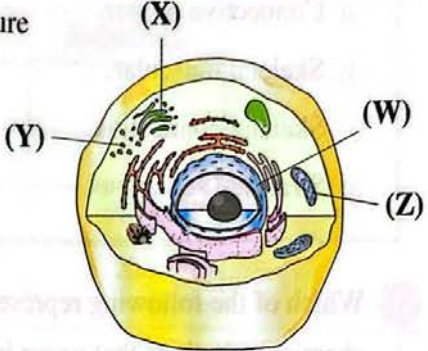
13 * In the following two figures, cell (B) stimulates cells (A) to contract, this process is beneficial in ....


(A)


(B)

ⓐ the movement of food inside the digestive canal.
ⓑ pumping the blood from the heart into the blood vessels.
ⓒ picking up the book from the desk.
ⓓ the secretion of mucus in trachea.

14 Which of the illustrated structures in the opposite figure is produced by the organelle that is responsible for the aggregation of proteins and the insertion of some modifications to them ?



ⓐ (W).
ⓑ (X).
ⓒ (Y).
ⓓ (Z).



Answer the following questions (15 : 16) :

15 Nitrogen element is found in each of proteins and nucleic acids. **Explain this.**

____
____
____
____
____
____

16 **In the light of your study to the metabolism, what happens to :**

The body after passing few hours from eating a meal rich in carbohydrates ?

____
____

General Exam 9



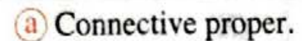
Choose the correct answer (1 : 14) :

1. What is the building unit from which the thickening substance of parsley plant stem cells is formed ?

   (a) Cellulose. (b) Glycogen. (c) Glucose. (d) Sucrose.

2. The opposite figure shows Achilles tendon that links Gastrocnemius muscle with heel bone. To which of the following tissues Achilles tendon belongs ?



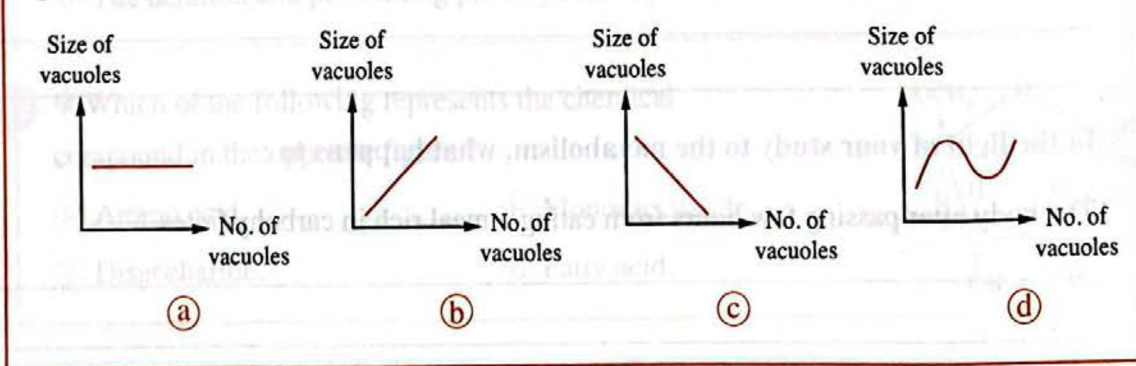


   (a) Connective proper.
   (b) Skeletal muscular.
   (c) Skeletal connective.
   (d) Stratified squamous.

3. Which of the following represents the main factor for increasing the surface area of chemical reactions that occur in mitochondria ?

   (a) Number of cristae.
   (b) Thickness of inner membrane.
   (c) Size of space between inner and outer membranes.
   (d) Thickness of outer membrane.

4. Which of the following graphs expresses the number of vacuoles and their size in parenchyma cells ?



5 * If you know that the binding of two molecules of glucose is accompanied by the removal of a water molecule, what is the molecular formula of the polymer that consists of four molecules of glucose ?

ⓐ $C_{24}H_{48}O_{24}$ ⓑ $C_{24}H_{44}O_{22}$ ⓒ $C_{24}H_{42}O_{21}$ ⓓ $C_{24}H_{46}O_{23}$

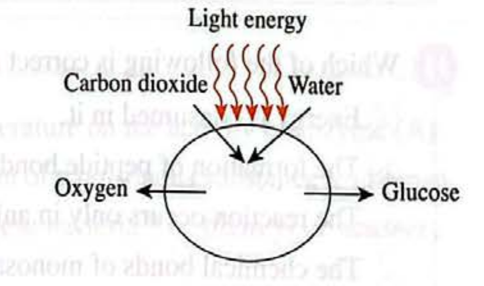
6 * The following figure illustrates the mechanism of the enzyme's action :



What does each of (W), (X) and (Y) represent in this chemical reaction ?

	Enzyme	Products	Substrate
ⓐ	W	X	Y
ⓑ	X	W	Y
ⓒ	X	Y	W
ⓓ	Y	W	X

7 At which organelle of the following does the shown vital process occur ?



ⓐ Mitochondrion.



ⓑ Chloroplast.

ⓒ Golgi body.

ⓓ Leucoplast.

8 During the division of a plant cell, which of the following can be seen by the light microscope ?

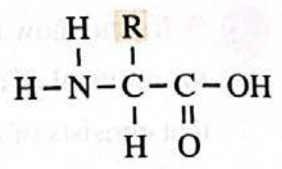
ⓐ Two centrioles.

ⓑ Chromosomes.

ⓒ The structure of the cell wall.

ⓓ The structure of the plasma membrane.

9 Which of the following statements is correct about the chemical compound shown in the opposite figure ?



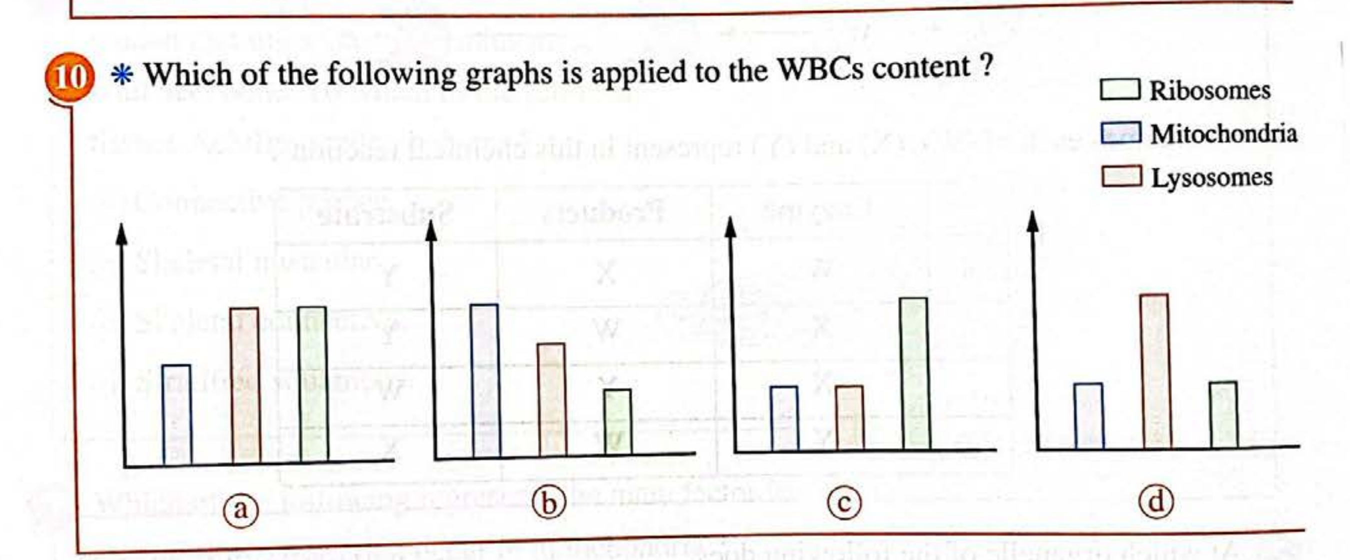
ⓐ It enters in the structure of muscles.

ⓑ It gains energy rapidly inside the cell.

ⓒ It enters in the cell wall structure.

ⓓ It has a role in transporting the genetic information from parents to offspring.

10 * Which of the following graphs is applied to the WBCs content ?



11 Which of the following is correct about the formation of starch from monosaccharides ?

ⓐ Energy is consumed in it.

ⓑ The formation of peptide bonds is required.

ⓒ The reaction occurs only in animal cells.

ⓓ The chemical bonds of monosaccharides are broken.

12 The liver participates in getting rid of toxins from the body, which of the following is/are the most abundant in the liver cells to perform this process ?

ⓐ Rough endoplasmic reticulum.

ⓑ Smooth endoplasmic reticulum.

ⓒ Ribosomes.

ⓓ Vacuoles.

13 What is the similarity between each of centrosome and centromere ?

ⓐ Both consist of two parts.

ⓑ Both are from membranous organelles.

ⓒ Both are present in the brain cells.

ⓓ Both are related to the cell division.

14 The opposite table illustrates four test tubes that contain equal amounts of starch with the salivary amylase enzyme, in which test tube is the starch hydrolyzed faster ?

	Temperature	pH
ⓐ	27	2
ⓑ	37	2.5
ⓒ	27	7
ⓓ	37	7.5

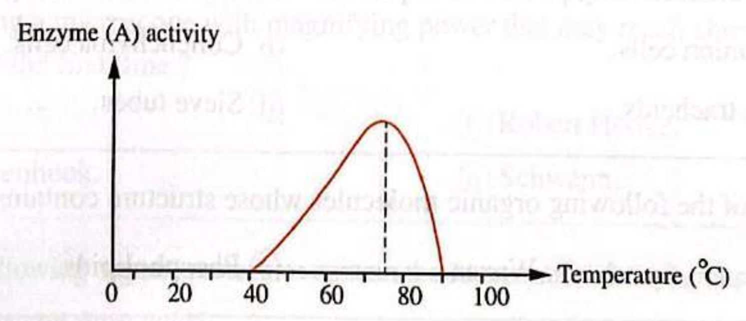
Answer the following questions (15 : 16) :

15 The simple microscope of Van Leeuwenhoek differs from the simple microscope of Robert Hooke. **Explain this.**

....

....

16 The following graph illustrates the effect of temperature on the activity of enzyme (A) (in a type of bacteria) that stimulates the formation of a poisonous substance for human, **what happens if** a person eats food containing these bacteria ? **Explain your answer.**



....

....

....



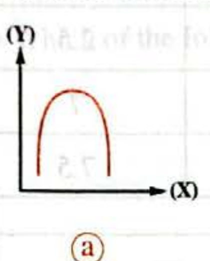
General Exam 10

Choose the correct answer (1 : 14) :

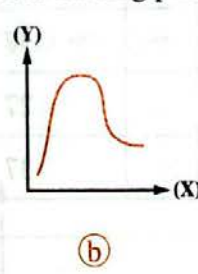
1. Which of the following organelles are responsible for building the major organic compound for producing energy in the plant cell ?

ⓐ Ribosomes. ⓑ Lysosomes. ⓒ Green plastids. ⓓ Leucoplasts.

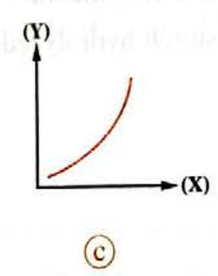
2. * Which of the following graphs expresses the relation between Golgi body activity (X) and the number of bacteria causing pneumonia (Y) ?



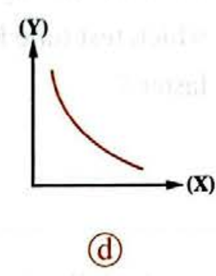
ⓐ



ⓑ

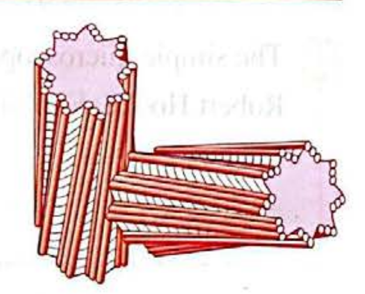


ⓒ



ⓓ

3. What is the similarity between the opposite organelle and ribosomes ?



ⓐ Both are non-membranous organelles.

ⓑ Both have a role in energy production.

ⓒ Both are found in plant cell.

ⓓ Both support the cell.

4. Which of the following plant cells depend in their function on other plant cells ?

ⓐ Companion cells. ⓑ Collenchyma cells.

ⓒ Xylem tracheids. ⓓ Sieve tubes.

5. * Which of the following organic molecules whose structure contains one fatty acid ?

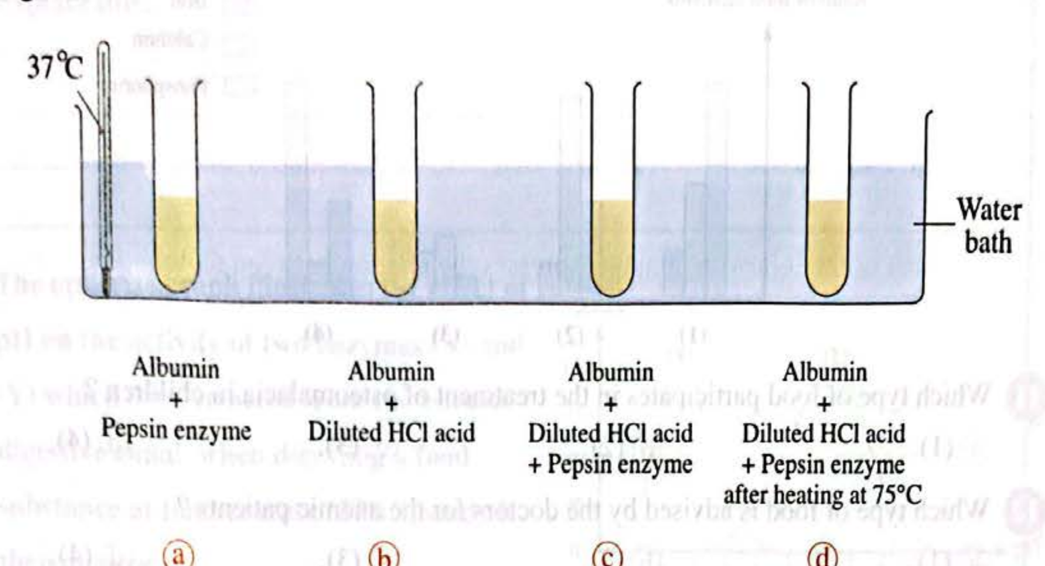
ⓐ Fats. ⓑ Waxes. ⓒ Phospholipids. ⓓ Oils.

6. Which of the following **can't** be seen under the light microscope when examining stained cells from onion plant with magnifying power (400x) ?

ⓐ Cell wall. ⓑ Nucleus. ⓒ Cytoplasm. ⓓ Mitochondria.



7 ✱ The following figure illustrates an experiment for the digestion of albumin by pepsin enzyme that is extracted from the human stomach, in which test tube the protein will be digested ?



8 If you know that phagocytes are a type of white blood cells that engulf and digest the bacteria and cells debris, which of the following plays an indirect role in the digestion of these substances ?

ⓐ Lysosome.
ⓑ Centrosome.
ⓒ Rough endoplasmic reticulum.
ⓓ Smooth endoplasmic reticulum.

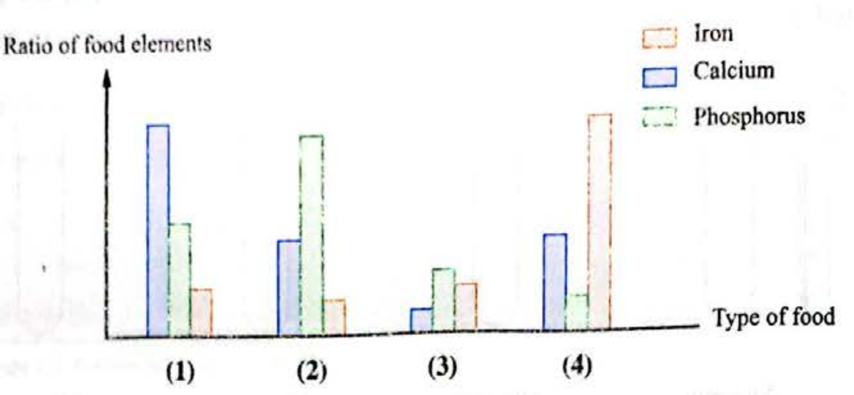
9 Who is the scientist that could see the green scum which covers the stagnant water surface by using a microscope with magnifying power that may reach about 180 times of its real size for the first time ?

ⓐ Virchow. ⓑ Robert Hooke.
ⓒ Van Leeuwenhoek. ⓓ Schwann.

10 Which of the following organic molecules contain the functional carboxyl group $\left(-\overset{\overset{\displaystyle O}{\|}}{C}-OH\right)$?

ⓐ Amino acids and fatty acids.
ⓑ Amino acids and glycerol.
ⓒ Fatty acids and Monosaccharides.
ⓓ Monosaccharides and glycerol.

The following graph illustrates the ratio of food elements in different types of food, study it, then answer :



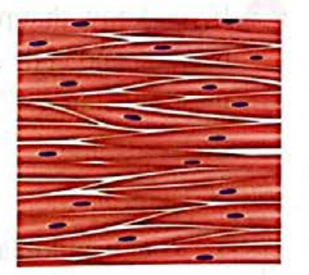
11 Which type of food participates in the treatment of osteomalacia in children ?

ⓐ (1). ⓑ (2). ⓒ (3). ⓓ (4).

12 Which type of food is advised by the doctors for the anemic patients ?

ⓐ (1). ⓑ (2). ⓒ (3). ⓓ (4).

13 The opposite figure represents a muscle present in ....



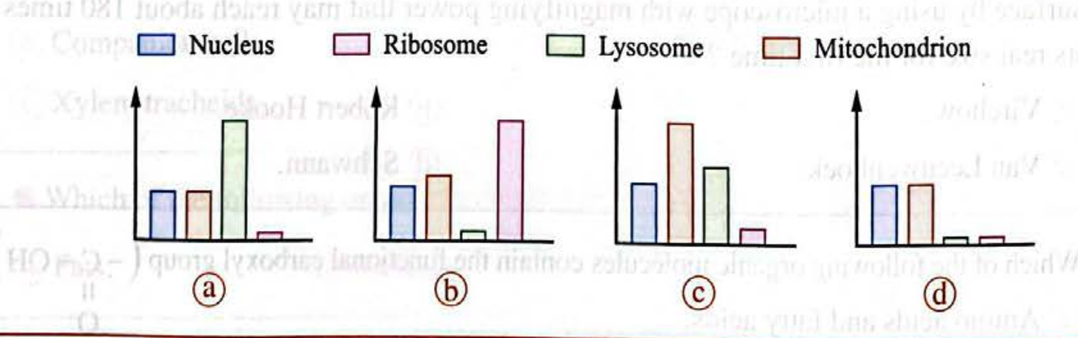
ⓐ the stomach lining.

ⓑ the stomach wall.

ⓒ the artery lining.

ⓓ the alveoli walls.

14 The following graphs illustrate the components of 4 different animal cells, which cell contains the largest content of protein ?

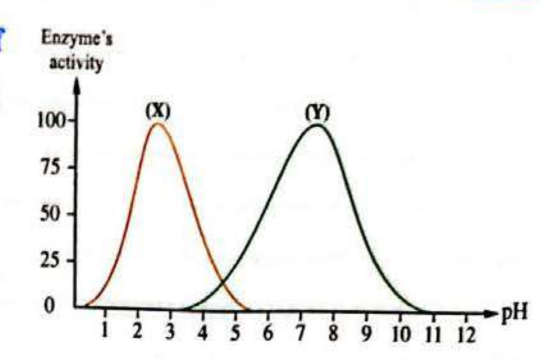


Answer the following questions (15 : 16) :

15 Using dyes on examining the living specimens is considered a double-edged weapon. **Explain this.**

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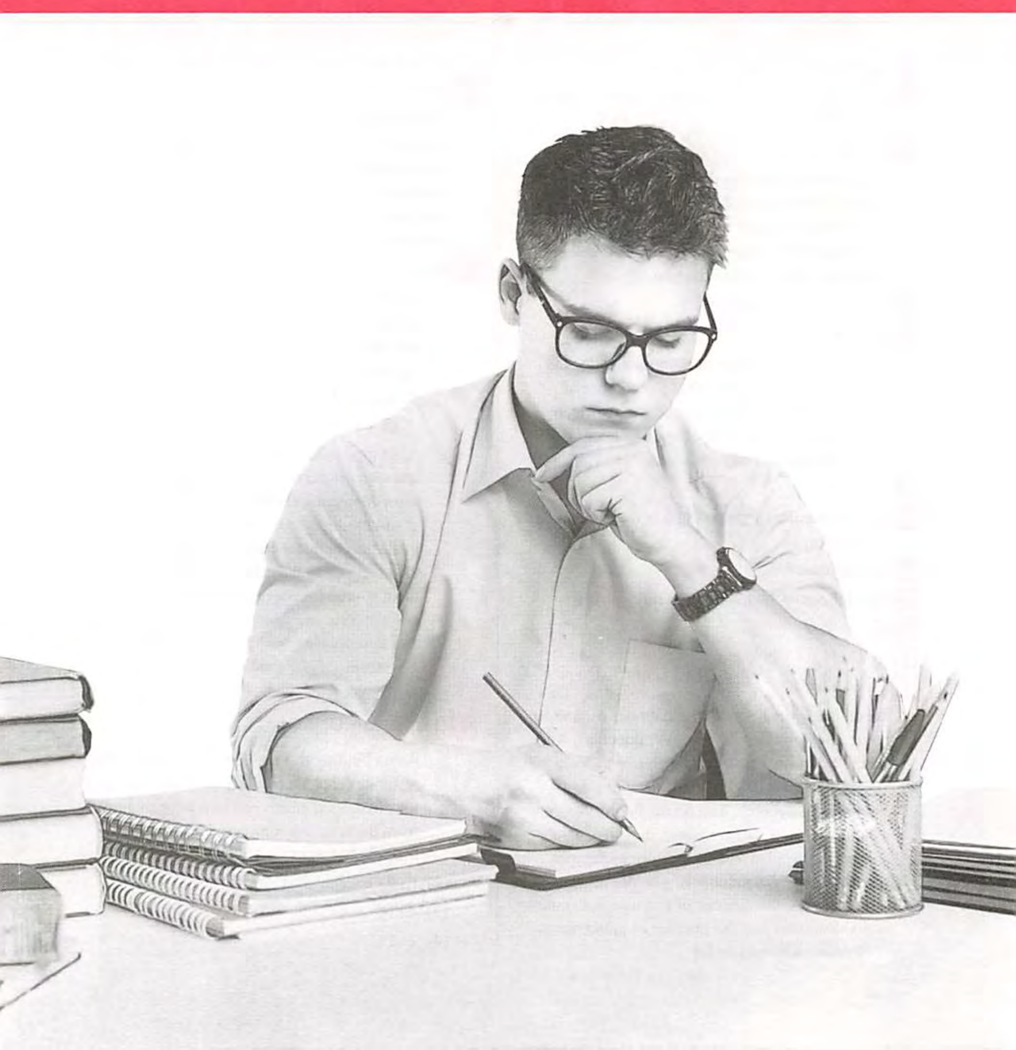
16 **The opposite graph illustrates the effect of pH on the activity of two enzymes (X) and (Y) which are extracted from the human digestive canal, when digesting a food substance at temperature (37°C), study it, then answer :**



(a) What is the reason for carrying out this experiment at 37°C ?

(b) What is the effect of increasing the pH value on the activity of enzyme (Y) ?

Answers of the Book Questions



UNIT 1

Answers of Chapter 1

Preliminary Lesson & Lesson One

First Answers of Multiple Choice Questions

1 (a) Organelles.

2 (a) Carbon, hydrogen and oxygen.

3 (b) The difference in the types and the quantity of organic molecules that are formed by the living organism.

4 (b) The two statements are wrong.

5 (b) The first statement is correct and the second statement is wrong.

6 (c) polymerization.

As the plant stores the excess of glucose which is resulted from the photosynthesis process in the form of starch that is formed from the combination of monomers (glucose) together by a process called polymerization.

7 (a) 3 : 6 oxygen atoms.

8 (a) $\frac{1}{2}$X

As the general formula of monosaccharides is $(CH_2O)_n$. So, it is shown that the number of carbon atoms is half the number of hydrogen atoms. So, if the number of hydrogen atoms = (X), the number of carbon atoms = $\frac{1}{2}$ X

9 (a) 5

10 (b) 3 molecules of grape sugar and 3 molecules of fruit sugar.

11 (a) Sucrose.

12 (c) Maltose → Glucose → Energy → ATP

13 (b)

14 (c) $C_{12}H_{22}O_{11}$

15 (d) 60 / 10 /10

As on the hydrolysis of 20 molecules of maltose sugar, they produce 40 glucose molecules. And on the hydrolysis of 10 molecules of lactose sugar, they give 10 glucose molecules and 10 galactose molecules. And on the hydrolysis of 10 molecules of sucrose sugar, they give 10 glucose molecules and 10 fructose molecules, therefore the total number of glucose molecules is 60 molecules, the number of fructose molecules is 10 molecules and the number of galactose molecules is 10 molecules.

16 (b) Wheat powder.

17 (b) Glucose.

18 (b) Glycogen.

19 (d) ATP

As the stored energy in the chemical bonds that found in the glucose molecule is released when oxidized in the mitochondria to be stored in ATP molecules, when a person walks for short distances, the muscle cells exploit the stored energy in ATP molecules as a direct source of the energy that is required for contraction and relaxation of muscles and the person movement.

20 (d)

As when the molecular structure (the number of atoms of the elements forming the glucose molecule) increases, the molecular weight (the total mass of the atoms forming the glucose molecule) increases, the relation is directly proportional.

21 **(1)** (a) (1).

As the malt sugar "maltose sugar" is composed of two identical units of glucose sugar (A), and these identical units are expressed only by equation (1).

(2) (b) Sugar (A) enters in the structure of disaccharides only.

Assuming that symbols (A, B and C) are hexacarbon sugars, therefore they have the same molecular formula and the same number of atoms. As symbol (A) is the main element in all the chemical equations which represents the glucose sugar, therefore it becomes the main source for energy production in the cell and enters in the structure of disaccharides and also polysaccharides, as starch and glycogen.

(3) (d) (2) or (3).

22 **(1)** (b) $C_{18}H_{32}O_{16}$

As on binding three glucose molecules, two water molecules are eliminated (i.e. losing of four hydrogen atoms and two oxygen atoms) from the resulted compound and its final formula becomes $C_{18}H_{32}O_{16}$

(2) (b) 9

(3) (c) 14

(4) (c) 12

(5) (b) 5

As on the formation of maltose molecule, one water molecule is eliminated, therefore the number of resulted water molecules on the formation of five maltose molecules equals five water molecules.

23 (c) ATP

24 (b) Glycogen.

25 (d) Cellulose.

As newspapers and books are made from different parts of plants where their cell walls are mainly composed of cellulose fibers.

26 (d) (X) is resulted from polymerization process.

27 (d) Glucose → Energy → ATP → Energy.

As when the glucose sugar is oxidized (that resulted from photosynthesis process) inside the cells in the mitochondria, the stored energy in the chemical bonds that found in the glucose molecule is released to be stored in ATP molecules which transferred to other places in the cell to complete all the vital processes in the cell, as the ATP molecules are converted into ADP molecules and the energy is released. So, the correct choice is (d)

28 (a) Carbohydrates.

29 (b) Grape sugar / Ribose sugar.

30 (1) (d) Glycogen.

(2) (d) Sucrose.

31 (c) Glucose / Fructose.

32 (c) Glycogen.

33 (b) Maltose, glycogen and starch.

34 (c) vegetables rich in cellulose fibers.

35 (c) The building units of each one.

36 (b) Y / X

As the change in Benedict's reagent colour into orange in solution (X) is an indication that it contains glucose sugar, while in case that the colour of Benedict's reagent and iodine solution don't change in solution (Y), this indicates that it is not from carbohydrates.

37 (a)

38 (d) Absence of water bath.

Second Answers of Miscellaneous Questions

1 *Answer by yourself.*

2

The glucose polymer in plant (Cellulose and starch)	The glucose polymer in animal (Glycogen)
• Cellulose : enters in the structure of the plant cell walls. • Starch : stores energy in the cells, till be needed.	It is stored in the liver cells and muscles, and works on storing the energy, till be needed.

3 (a) • Starch or cellulose.

• The importance of starch for the plant : plants store carbohydrates in the form of starch to be used for producing energy when it is needed.

• The importance of cellulose for the plant : it enters in the structure of plant cell walls.

(b) When the plant converts starch (complex sugar) into glucose (monosaccharide) molecules that are oxidized inside the cells in the mitochondria, the following takes place :

• The stored energy in the chemical bonds that are present in glucose molecule is released to be stored in compounds called adenosine triphosphate (ATP).

• The ATP compounds transfer into other places in the cell to use the energy stored in them for accomplishing all the vital processes in the cell.

4 The colour of Benedict's reagent will not change, as the wheat powder contains starch which is a complex sugar that doesn't change the colour of the Benedict's reagent.

5 The colour of iodine solution will change from orange to dark blue, because rice contains starch.

Answers of New Types of questions

1 (c) Sodium bicarbonate.

(e) Glucose sugar.

2 (b) Cellulose sugar.

(d) Glycogen sugar.

3 ⓐ They contain hydrogen.
ⓓ They contain oxygen.

4 ⓐ Starch.
ⓒ Cellulose.

5 **(a)** Glucose.
(b) Adenosine triphosphate.

6 **(a)** Maltose.
(b) Lactose.

7 **(a)** Glycogen.
(b) Sucrose.

Answers of Chapter 1 Lesson Two

First Answers of Multiple Choice Questions

1 ⓓ They contain C, H and O with unlimited ratio.

2 ⓓ Cellulose.

3 ⓒ The type of fatty acid and alcohol.

4 ⓑ They contain greater amount of energy than that of the cane sugar.

5 ⓑ A certain type of fatty acids.

6 ⓓ

7 ⓐ is in solid state.

8 ⓒ High molecular weight fatty acids and monohydric alcohols.

9 ⓒ waxes.

10 ⓓ 20
As the phospholipid molecule contains 2 fatty acids, therefore the number of fatty acids in 10 molecules of phospholipid equals 20 fatty acids.

11 ⓓ They have a low molecular weight.

12 ⓑ Steroids.

13 ⓑ Fatty acids.

14 ⓑ Fatty acids and glycerol.

15 ⓑ (2).
As tube (1) gives positive result for the indication of one of the simple sugars as glucose, the colour of Benedict's reagent converted from blue into orange, while tube (2) gives positive result for the indication of lipid where Sudan-4 reagent is dissolved in fats to be converted into red colour, while tube (3) gives positive result for detecting the starch (complex sugar) where the orange iodine colour converted into blue. So, tube (2) contains the highest amount of energy.

16 ⓐ Fats / Oils / Oils.

17 ⓒ

18 **(1)** ⓑ They contain a smaller number of hydrogen atoms than that in the fats.
As oils are composed of unsaturated fatty acids, i.e. they contain many dicovalent bonds, so that they contain a less number of hydrogen atoms bound to the carbon atoms comparing with fats that contain the same number of carbon atoms, as fats are composed of saturated fatty acids, i.e. they contain single covalent bonds only, so that the number of hydrogen atoms bound to carbon atoms are greater.

(2) ⓒ It is common in the plant than the animal.

(3) ⓐ Increase of hydrogen atoms.

19 ⓑ Grapes / Sugarcane juice / Bread / Butter.

20 **(1)** ⓐ (X).

(2) ⓑ (Y).

(3) ⓓ Type of alcohol.
As the two compounds (L) and (Z) represent oils and fats and both are soluble in carbon tetrachloride, as glycerol alcohol enters in their structures, but one of them consists of saturated fatty acids (fats) and the other consists of unsaturated fatty acids (oils). So, they are different in the type of fatty acids. So, they have different molecular structure, as oils and fats are different in the physical state as oils are liquid substances, while fats are solid substances at room temperature.

(4) ⓒ Type of alcohol.

21 ⓒ Cholesterol.
As the chemical formula contains hydroxyl group (OH), this is an indication to the probability of glycerol presence in the structure, therefore the molecular formula maybe for a phospholipid molecule or cholesterol molecule. But the chemical formula doesn't contain nitrogen and phosphorus atoms which indicates that it is not phospholipids and the formula maybe for cholesterol.

22 (d) Phospholipids.
As phospholipids are complex lipids, while testosterone and estrogen hormones (steroids), and cholesterol are resulted from the hydrolysis of simple and complex lipids (lipid derivatives).

23 (a) 3g
As the amount of energy gained from lipids is greater than that gained from the same amount of carbohydrates. So, for having the same amount of energy that is gained from 5g of glucose, a lower amount of fatty acids will be oxidized (less than 5g). So, the correct choice is (a)

24 (d) More than 38

25 (b) Cellulose / Phospholipids / Glycogen.

26 (b) The reaction between three molecules of (1) with a molecule of (4).

27 **(1)** (d) Glucose / Starch / Lipid.
(2) (b) Benedict's reagent / Iodine solution / Sudan-4 reagent.
(3) (d) Dissolves / Doesn't dissolve / Doesn't dissolve.

28 (a) Oils / Fats / Waxes.
As both (X) and (Y) contain 3 hydroxyl groups, this is an indication that they represent oils and fats or the opposite, and (Z) contains one hydroxyl group, this is an indication that it represents waxes, and as (Y) and (Z) have the same physical state, so that (Y) represents fats, (Z) represents waxes and (X) represents oils.

Second Answers of Miscellaneous Questions

1 Because some wall's paintings contain fatty substances that are not soluble in the polar solvents, such as water, but they are soluble in the non-polar solvents, such as benzene.

2 As some spots are from fatty substances that are soluble in benzene and other spots that are not from fatty substances soluble in water.

3 The water loss in plant will increase due to transpiration process that leads to its death.

4 • In figure no. (1), the amount of water remains constant / Due to the presence of an oil layer that is insoluble in water and covers its surface, preventing its evaporation.
• In figure no. (2), the amount of water decreases / Because water that is exposed to Sun will partially evaporated, therefore its amount decreases.

5

The substance that covers the cactus leaves (Waxes)	The substance that stored under the human skin (Fats)
• It is formed by the reaction of high molecular weight fatty acids with monohydric alcohols.	• It is formed by the reaction of saturated fatty acids with glycerol (trihydric alcohol).
• It reduces the transpiration process in the desert plants.	• It acts as a thermal insulator to maintain the body temperature.

6 **(a)** All of them are simple lipids.
(b) All of them containing glycerol in their structures.

7 Due to the presence of fats that stored under the skin of penguin that work as a thermal insulator to maintain its body temperature in polar regions, while hawk can't live in polar regions, due to the absence of fatty layer under its skin.

8 **The statement is correct** / As cholesterol is from the lipid derivatives that are derived from the hydrolysis of complex lipids, such as phospholipids.

9

P.O.C.	Organic compound that is stored in cactus	Organic compound that covers the cactus surface
Name :	Starch	Waxes
Type of the compound :	Carbohydrates (complex sugar)	Lipids (simple lipid)
Solubility :	Insoluble in water.	Insoluble in water and soluble in non-polar solvents, such as benzene and carbon tetrachloride.

10

The anomalous word	What links the rest
Phospholipids	Lipid derivatives.

11 As fats are stored in the body in insulating layers under the skin, leading to obesity, as well as the body doesn't start to extract energy from fats that are stored in it, unless carbohydrates are absent.

12 The body will get the energy from fats that are stored in it to perform the vital processes.

13 **The statement is wrong** / As the amount of energy produced from 3 g of animal fats (lipids) is greater than the amount of energy produced from 3 g of rice (carbohydrates).

14 **The statement is correct** / As the reduction eating carbohydrates helps the body to get the energy from fats that are stored in it, helping in getting rid of fats, because the body doesn't start to extract energy from the stored fats, unless carbohydrates are absent.

15 Sudan-4 reagent.

16 15 molecules of glucose → 10 molecules of glycogen → 5 molecules of fats.

Answers of New Types of questions

1 ⓑ The stored fats that are present beneath the skin of some animals.

ⓔ Waxes that cover the leaves of desert plants.

2 ⓒ Both of them are from biological macro-molecules.

ⓔ Both of them contain glycerol in their structures.

3 ⓒ Condensed cream / Olive fruits.

ⓔ Full-cream yoghurt / Corn grains.

4 ⓑ Sesame grains / Condensed cream / *Opuntia*.

ⓓ Olive fruits / Full-cream yoghurt / Cactus leaves.

5 ⓒ Both of them are biological macro-molecules.

ⓓ Both of them don't dissolve in water.

6 ⓐ Rice / Condensed cream.

ⓒ Sugarcane juice / Butter.

7 **(a)** Phospholipids.

(b) ATP

8 **(a)** Iodine solution.

(b) The orange colour of solution.

Answers of Test on Chapter 1

1 ⓓ

2 ⓐ The two statements are correct and related.

3 ⓒ Because the energy can be extracted from carbohydrates easily.

4 ⓑ Glucose , Cellulose and ATP

5 ⓑ Glucose.

6 ⓑ Type of fatty acids that form them.

7 ⓐ The muscle consumes glycogen during exercises.

8 ⓑ The presence of a thick waxy layer that covers their leaves.

9 ⓒ Because they are soluble in non-polar solvents.

10 ⓑ B

11 The stored biological macro-molecules in the grain is starch.

12 Cell walls will dissolve in water, because maltose is a disaccharide sugar that belongs to simple sugars, where simple sugars are soluble in water.

13 As in fasting period, the fast source of energy in the body (carbohydrates) is very low, so that the body resorts to get energy from fats, where they are considered an important source for obtaining energy, but the body doesn't begin to get the energy that is stored in fats, unless in case of the absence or lack of carbohydrates and the amount of energy gained from lipids is more than that gained from carbohydrates. Therefore, the fasting person can practice his daily activities.

14 **This statement is wrong** / As phospholipids are similar to the structure of fat molecules with replacing the third fatty acid in fats by a phosphate group and choline group, i.e. it consists of two fatty acids, glycerol molecule, phosphate group $(PO_4)^{3-}$ and choline group.

15 Complex sugars (polysaccharides) as cellulose / Carbohydrates.

16 It will lose the fats that are stored under his skin as no need to act as a thermal insulator for keeping its body temperature or it will die, because it can't bear the hot climate.

17
- Adding some drops of iodine solution to the two unknown powders, if the orange colour of iodine solution turns into dark blue in one of them. So, one of them is starch (complex sugar "polysaccharide") and the second unknown belongs to the simple sugars (monosaccharides or disaccharides).
- Then adding Benedict's reagent on the second sample and put it in a water bath for 5 minutes if the colour of Benedict's reagent changes into orange. So, it contains monosaccharide and if not changed, it contains disaccharide.

Answers of Chapter 2 Lesson One

First Answers of Multiple Choice Questions

1 ⓐ Carbon.

2 ⓓ

3 ⓐ 1

4 ⓓ secondary products in both reactions.
As the glycosidic bonds and the peptide bonds arise by removing a water molecule where it is considered the secondary product in both reactions.

5 ⓒ 7

6 **(1)** ⓒ Order of amino acids.
(2) ⓑ Types of amino acids.
(3) ⓒ Valine / Alanine / Valine / Alanine / Methionine.

7 ⓒ Glycine.

8 **(1)** ⓓ (4).
As the gas exchange process takes place through the haemoglobin of the red blood cells, where the iron element enters in its structure, therefore the efficiency of gas exchange increases by increasing the iron percentage entering in its structure.
(2) ⓑ (2).

9 ⓒ 101
As the protein is formed through the binding of amino acids by peptide bonds, where each peptide bond is formed between two amino acids by removing a water molecule. Therefore, when adding 100 water molecules to digest the protein, it means that the protein is formed of 101 amino acids.

10 ⓐ Amino group / Carboxyl group.
As the peptide bond is arisen by removing a water molecule through the binding of H^+ ion from the amino group (NH_2) "structure (1)" of an amino acid with (OH^-) group from the carboxyl group "structure (2)" of its adjacent amino acid.

11 ⓐ ✓ / ✓ / ✓ / ✓

12 ⓐ Casein.

13 ⓒ Lactose.

14 ⓒ Meats and eggs.

15 ⓒ Casein.
As milk contains casein protein that contributes in the structural building of the child's body, where proteins enter in the structure and functions of all living cells, such as muscles, ligaments, tendons and organs.

16 ⓐ

17 ⓑ alkyl group

18 ⓓ Bean seeds powder.
As Biuret's reagent is used for detecting the protein in food, the bean seeds are characterized by being rich in protein, therefore the blue colour of Biuret's reagent changes into violet colour in the presence of bean seeds powder, while malt powder, wheat powder and grape juice are foods rich in carbohydrates.

19 ⓓ Olive oil – Egg albumin.

20 ⓒ 19

21 ⓑ Amino acids / Polypeptide chain

22 ⓑ ✓ / ✗ / ✓
As excess of glucose is stored in rabbit's muscles and its liver in the form of glycogen till need it and the fats are stored under the skin to act as a thermal insulator that keeps its temperature in north pole, while the body doesn't store the proteins, but they enter in the structure and functions of all living cells.

23 ⓐ Thyroxine.
As many hormones are considered proteins, and these hormones stimulate and regulate all the vital processes in the body, therefore thyroxine hormone "the thyroid gland protein" is from the regulatory proteins.

24 ⓑ a deficiency in iron.

25 ⓓ Protein.

26 ⓓ difference in the functional group at the terminal of the chain.
As adding an amino acid to the polypeptide chain causes the change in the type of protein, due to the difference in the sequence of amino acids in the polypeptide chain of the resulted protein from the sequence of original chain, this leads to the increase in the number of peptide bonds as a result of the formation of a new peptide bond and the removal of a water molecule, but this doesn't affect the free functional groups at the two ends of the chain (free carboxyl group and free amino group).

27 ⓐ The protein's type would change.

28 ⓐ One chain.

29 ⓑ Peptide bond formation.

30 **(1)** ⓒ Butter. **(2)** ⓐ Rice.
(3) ⓑ Grapes. **(4)** ⓑ Meat.

31 **(1)** ⓓ (4). **(2)** ⓑ (2).
(3) ⓐ (1). **(4)** ⓐ (1).

32 ⓑ Polymerization / One molecule.

33 ⓒ Honey.

34 **(1)** ⓑ (2) only. **(2)** ⓒ (2) only.
(3) ⓑ (3) only. **(4)** ⓑ (3) only.

35 ⓒ 49 bonds.
As 20 peptide bonds are formed in chain (A) and 29 peptide bonds are formed in chain (B), therefore the total number of peptide bonds in the insulin molecule is 49 peptide bonds.

Second Answers of Miscellaneous Questions

1 Amino acid.

2 Protein.

3 The amino acid will change into another amino acid.

4 Due to the difference of the alkyl group (R) from an amino acid to another.

5 **The statement is wrong** / As there are many protein compounds, because proteins differ between each other according to the types, order and numbers of amino acids in the polypeptide chain.

6 As when the polypeptide chain is formed, repeated units of amino acids are linked together by peptide bonds, and the peptide bond arises between the carboxyl group (COOH) of an amino acid and the amino group (NH_2) of the adjacent amino acid through the removal of a water molecule, where the (OH^-) group of carboxyl group of an amino acid binds with (H^+) ion of amino group of the adjacent amino acid, forming a water molecule. So, it is considered a dehydration reaction.

7 The type of protein will change.

8 The figure doesn't represent an amino acid / Because the figure doesn't contain a carboxyl group (COOH) and an amino group (NH_2) which are the two functional groups of the amino acid.

9 **(a)** Thyroxine protein.
(b) Haemoglobin protein.

10 **The statement is correct /** As some proteins that are present in the plant cells are similar to some proteins that are present in human, such as :
- Albumin protein : is present in the leaves, seeds and roots of plants, and also present in the blood plasma of human.
- Nucleic proteins : are present in the nucleus chromatin of the plant and animal cells.

11 One type of protein will be formed, and there will not be probabilities to form other types of proteins.

12 I advise them to eat foods rich in iron, as iron element enters mainly in the structure of blood haemoglobin (protein of red blood cells), where it results from the binding of amino acids with iron element.

13 **The statement is correct** / As iodine enters in the structure of thyroxine protein which is the hormone (protein) of thyroid gland, and results from the binding of amino acids with iodine element.

14 Thyroxine hormone (thyroid gland protein).

15 As seafood are rich in phosphorus element which helps the lactating mothers in the formation of casein protein that is necessary for the formation of milk, and consists of amino acids bound with phosphorus element.

16 As the proteins enter in the structure of each of the muscles, tendons and ligaments, and all of them help in the animal movement.

17

P.O.C	Albumin	Haemoglobin
Location :	Blood plasma	Red blood cells
Type :	Simple protein	Conjugated protein
Its formation :	Amino acids only	Amino acids attached with iron element

18 **(a)** Proteins.

(b) Albumin protein / Simple protein.

19 **The statement is correct** / As the nitrogenous fertilizers supply the plant with nitrogen element that is necessary for the formation of amino acids which form proteins participating in the vital processes in the plant.

20 • Protein powder.

• Biuret's reagent.

21 Add to each type of the seeds' extracts :

- Iodine solution to detect the starch, where the orange colour of iodine will change into dark blue colour.
- Sudan-4 reagent to detect the lipids "oils", where the colour of the reagent will turn into red colour.
- Biuret's reagent to detect the proteins, where the blue colour of Biuret's will change into the violet colour.

Answers of New Types of questions

1 ⓐ The structural unit of protein / The structural unit of lipid.

ⓓ There are 20 types of them / There are two types of them.

2 ⓒ Iron enters in its structure / Iodine enters in its structure.

ⓔ It is called the red blood cells protein / It is called the thyroid gland protein.

3 ⓐ

ⓑ

4 **(a)** Amino acid.

(b) Monosaccharide.

5 **(a)** Carbon atom.

(b) Nitrogen atom.

6 **(a)** Amino acids

(b) Fatty acids and glycerol

7 **(a)** **(X)** Casein, **(b)** **(Y)** : Albumin

As two compounds (X) and (Y) are from the same type, which contain nitrogen. So, both are proteins, but compound (X) contains phosphorus element in its structure that indicates this is a conjugated protein "casein" and compound (Y) contains oxygen and nitrogen elements that indicates this is a simple protein "albumin".

Answers of Chapter 2 Lesson Two

First Answers of Multiple Choice Questions

1 ⓑ It contains three phosphate groups / It contains one phosphate group

As ATP molecule "adenosine triphosphate" contains three phosphate groups, also represents the currency of energy in all the living cells and doesn't contain peptide bonds, because it is not a protein, while DNA nucleotide contains one phosphate group, where their components are linked together by covalent bonds and it isn't found in all living organisms' cells, because there are organisms whose genetic material is RNA

2 ⓓ 8

As the sugar that enters in the structure of DNA nucleotide (deoxyribose sugar) is different from the sugar that enters in the structure of RNA nucleotide (ribose sugar). So, the number of nucleotides' types that enter in the structure of DNA nucleic acid is 4 nucleotides and also the number of nucleotides' types that enter in the structure of RNA nucleic acid is 4 nucleotides. Therefore, the total number of nucleotides that enter in the structure of nucleic acids is 8 nucleotides.

3 ⓐ Nucleotides / Nucleic acid.

4 ⓑ Ribose.

5 ⓒ 10

6 ⓐ DNA

7 ⓒ Phosphate group.

8 ⓑ

9 ⓒ Number of oxygen atoms.

10 ⓑ Nitrogen.

11 ⓒ Phospholipids.

12 ⓐ Peptide / Covalent / Covalent.

13 ⓒ DNA is present inside the nucleus and RNA is present in the nucleus and cytoplasm.

14 ⓓ (4).

15 ⓐ 75

As RNA nucleic acid is considered a single strand of nucleotides that is transcribed from one DNA strand. So, it contains half the number of nucleotides from which it is transcribed in DNA molecule, i.e. 75 nitrogenous bases.

16 ⓓ sequences of nucleotides in DNA

17 ⓒ DNA ⟶ RNA ⟶ Protein

18 ⓒ Each of the nitrogenous base and phosphate group will be separated from the nucleotide.

19 ⓒ Carrying the genetic information of the living organism.

20 **(1)** ⓒ (1) and (3).

As the sugar molecule that enters in the structure of nucleotide in two figures (1) and (3) represents deoxyribose sugar (which lacks an oxygen atom). So, they represent nucleotides in DNA structure, while the sugar molecule that enters in the nucleotide's structure in two figures (2) and (4) represents ribose sugar. So, they represent nucleotides in RNA structure.

(2) ⓓ (2) and (4).

21 ⓓ Genetic information in DNA molecules.

22 ⓓ DNA / Nucleotides

23 ⓒ Shape.

As each of thymine (T) and uracil (U) bases is composed of one ring, therefore they are similar in the shape, but they differ in the chemical structure, and also they differ in the sugar that each one of them is attached to, as the thymine base is attached to deoxyribose, while the uracil base is attached to ribose sugar, so that they differ in the polymer that enters in their structure.

24 ⓓ $C_5H_{10}O_4$

25 ⓐ Zero.

As DNA molecule is different from RNA molecule in the type of sugar entering in the structure of the nucleotide of each of them, therefore the number of types of the common nucleotides between DNA and RNA molecules is zero.

26 ⓒ Nucleotide.

As the chromosome is composed of protein and DNA which is composed of repeated units of nucleotides.

27 ⓓ Uracil.

28 ⓓ ✓ / ✓ / ✓ / ✓ / ✓

29 ⓒ Deoxyribose sugar / Phosphate group / Guanine.

As the diagrammatic figure represents DNA double strands, therefore (1) represents deoxyribose not ribose sugar, (2) represents phosphate group that is attached to the carbon atom no. (5) of the sugar molecule by a covalent bond, (3) represents a nitrogenous base (guanine) that is attached to the carbon atom no. (1) of the sugar molecule.

30 **(1)** ⓐ $C_5H_{10}O_5$ **(2)** ⓒ Adenine.

31 **(1)** ⓒ Adenine and thymine.

(2) ⓓ

32 ⓑ Cell wall.

As the cell wall is composed of cellulose where carbon, oxygen and hydrogen only enter in its structure, while nitrogen enters in the structure of the cell membrane that contains phospholipid molecules, besides the albumin protein consists of amino acids which nitrogen enters in its structure. Also, nitrogen enters in the structure of the nitrogenous bases of the DNA nucleic acid.

33 ⓓ Amylase enzyme.
As DNA nucleic acid carries the genetic information (genes) that is transcribed into RNA nucleic acid, then it is transferred into cytoplasm to form proteins that the cell needs, such as enzymes as amylase enzyme.

34 ⓐ

Second Answers of Miscellaneous Questions

1 **The statement is wrong /** As the monosaccharide in RNA molecule is ribose (5C) sugar, and the building unit of starch is glucose (6C) sugar.

2

The anomalous word	What links the rest
Nucleic acids	Building units of some biological macro-molecules.

3 **The statement is correct /** As the ribose sugar enters in the structure of RNA molecule and it is pentose sugar, and according to the general formula of carbohydrates which is $(CH_2O)_n$, the molecular structure of ribose is $C_5H_{10}O_5$, i.e. it contains 5 oxygen atoms.

4 As the nucleotides bind with each other by covalent bonds to form the nucleic acid, while the amino acids bind with each other by peptide bonds to form the protein.

5 Nitrogenous base.

6 The polynucleotide (nucleic acid) will be formed.

7 As the polynucleotide is formed through the binding of several nucleotides with each other by covalent bonds, while the polypeptide is formed through the binding of several amino acids with each other by peptide bonds.

8 The figure (1) represents the building unit of the nucleic acid RNA / Because the monosaccharide in nucleotide is the ribose sugar, while the figure (2) represents the building unit of the nucleic acid DNA / Because the monosaccharide in nucleotide lacks one oxygen atom which is the deoxyribose sugar.

9 Nucleotide.

10 As the amino acids that form proteins, contain nitrogen element, as the amino group (NH_2) "basic" enters in its structure, as well as the nucleotides that form the nucleic acids (DNA and RNA), where the nitrogenous bases enter in their structure which contain also the nitrogen element.

11 **The statement is wrong /** As each of the adenine (A) and guanine (G) consists of two rings, therefore they have the same shape, but they differ in the chemical structure.

12 **(a)** As the nitrogenous base "thymine" (T) in figure (1) is replaced by the nitrogenous base "uracil" (U) in figure (2).

(b) Components of structure (Y) :

1. Pentose (5C) sugar and there are two types of sugar which are :
   - Deoxyribose sugar as in figure (1) "DNA".
   - Ribose sugar as in figure (2) "RNA".
2. Phosphate group : attaches with the carbon atom no. (1) of sugar molecule by covalent bond.

(c) Figure (2) "RNA" will not be formed, leading to the stopping of protein synthesis inside the cell.

13 **The statement is wrong /** As the deoxyribose sugar that enters in the structure of DNA nucleotide is composed of four oxygen atoms ($C_5H_{10}O_4$), while the ribose sugar that enters in the structure of RNA nucleotide is composed of five oxygen atoms ($C_5H_{10}O_5$).

Answers of New Types of questions

1 ⓑ Ribose sugar enters in its structure / It is formed of repeated glucose units.

ⓓ It is used in the synthesis of proteins / It stores energy in animal cells.

2 ⓒ Cytosine base enters in the structure of both of them.

ⓓ Phosphate group enters in the structure of both of them.

3 **(a)** Nucleotide.

(b) Phospholipid.

Answers of Test on Chapter 2

1 ⓑ

2 ⓑ 11

3 ⓓ Peptide bond only.

4 ⓑ Thyroxine.

5 ⓓ Four different building units in the chemical structure.

6 ⓓ The building unit of starch.

7 ⓒ DNA controls the formation of protein in the cell.

8 ⓐ Because it contains DNA only.

9 ⓐ The type of chemical bonds among the building units.

10 ⓒ (3) and (4).

---

11 The number of water molecules that are removed = 66 molecules.

---

12 The cell will not perform the vital processes, this leads to its death, as protein is contributed in the biochemical processes that keep the continuity of life, where they enter in the structure of enzymes and many hormones that stimulate and regulate all the vital functions in the body, and they enter in the structure and functions of all the living cells.

---

13 Both of them contain carbon (C), hydrogen (H), oxygen (O) and nitrogen (N) elements that enter in their structure.

---

14 RNA is transcribed (formed) from one strand of DNA inside the cell nucleus, then transferred into the cytoplasm to be used in the synthesis of proteins which the cell needs.

DNA $\xrightarrow{\text{Transcription}}$ RNA $\xrightarrow{\text{Translation}}$ Protein

---

15 **(a)** Amino acids.

(b) The body cells use these building units "amino acids" in performing functions and synthesizing the enzymes and many hormones that stimulate and regulate all the vital functions in the body. They enter in the structure of the living cells, as they :

- Are one of the basic components of the cell membranes and chromosomes.
- Form muscles, ligaments, tendons, organs, glands and so on.
- Enter in the structure of many vital body fluids such as blood and lymph.
- Are necessary for the body growth.

16
- Structure (X) "cell membrane" contains : phospholipids (complex lipids), cholesterol (lipid derivative), proteins and carbohydrates.
- Structure (Y) "nucleus" contains : proteins (conjugated protein "chromatin") and nucleic acid "DNA".

---

17 **(a)** Haemoglobin protein.

(b) Iron.

Answers of Chapter 3

First Answers of Multiple Choice Questions

1 ⓒ Polymerization.

2 ⓒ By which the energy required for performing the vital functions of the cell is obtained.

3 ⓐ A

4 ⓐ The absence of digestive enzymes for lactose.

5 ⓒ

As on adding the enzyme to the substrate, an unstable intermediate compound is formed that results in the reaction products which increase gradually with time, so that the substrate concentration decreases.

6 **(1)** ⓐ (X).

(2) ⓑ (Y).

7 ⓑ The saturation of active sites for enzyme's molecules with the substrate.

As during the enzymatic reaction, the speed of reaction increases by increasing the number of substrate's molecules linked with the enzyme's molecules till the saturation state in which the substrate's molecules bind to all the active sites of enzyme. Therefore, the constancy of the enzyme's activity occurs after a period of time from the reaction.

8 ⓒ

As the activity of catalase enzyme is affected by pH value, where each enzyme has its optimal pH value to work efficiently. So, if the pH value becomes lower or higher than the optimum, the enzyme's activity decreases till it stops. Therefore the correct choice is ⓒ

9 ⓒ It decreases.

10 ⓓ Substrate / Products / Enzyme.

11 ⓑ

12 ⓑ 30°C

13 ⓓ The rate of the enzyme's activity is equal at pH values (5) and (8.5).

14 ⓑ This enzyme works with a maximum efficiency in the acidic medium.

15 **(1)** ⓒ 35°C

As the optimal temperature of the enzyme is the temperature at which the enzyme's activity is the highest, which is 35°C

(2) ⓒ 15°C : 45°C

As the thermal range of the enzyme is the range between the temperature at which the enzyme's activity starts (15°C) and the temperature at which the enzyme's activity stops (45°).

16 **(1)** ⓑ By estimating the change in substrate's concentration.

(2) ⓒ The consumption of a large amount of substrate.

(3) ⓐ First and second minutes.

17 ⓑ A piece of meat / Pepsin

As the change in Biuret's reagent blue colour into violet colour is an indicator to that the substance (X) contains protein and when adding diluted HCl acid and substance (Y) in suitable conditions for the occurrence of reaction, this leads to the digestion of protein. So, we conclude that the substance (X) is a piece of meat, while the substance (Y) is pepsin enzyme.

18 ⓐ All proteins are enzymes.

19 **(1)** ⓐ (A) only.

(2) ⓑ (B) only.

(3) ⓐ (B) and (C).

As the graph illustrates that enzyme (A) works in the thermal range from (15°C : 45°C), while enzyme (B) works in thermal range from (5°C : 80°C), but enzyme (C) works in thermal range from (40°C : 80°C). So, enzyme (A) is characterized by working in the least thermal range and enzyme (B) is characterized by working in the widest thermal range, but enzymes (B) and (C) are characterized by having the ability to sustain the high temperature.

20 ⓐ The process no. (2) is catabolism, and the process no. (1) is anabolism.

21 ⓒ The rate of reaction increases till a certain limit then become constant.

As the rate of enzymatic reaction is estimated by the time that the enzyme takes for decomposing the substrate, through the analysis of the results illustrated in the graph, we find that the rate of reaction increases gradually by increasing the concentration of substrate (i.e. the enzyme takes little time to decompose the substrate) till reaching up to a certain concentration of the substrate (20%) at which the rate of reaction becomes constant even if the concentration of the substrate increases, this is due to the saturation of all active sites of the enzyme's molecules with substrate's molecules.

22 ⓒ The enzymes consist of lipids.

23 ⓑ Y

24 ⓒ Increasing the substrate concentration.

25 ⓑ E_1 is highly specific than E_3

As by increasing the number of active sites of the enzyme molecule, so that it can bind to more than one type of substrate (i.e. it becomes less specific). Therefore, we find that enzyme (E_1) has one active site at which it binds to substrate (S_2) only, while enzyme (E_3) has three active sites, so it can bind to substrates (S_1, S_2 and S_3). Therefore, we find that enzyme (E_1) is more specific than enzyme (E_3).

26 ⓒ Specializing in combination with a certain substance.

27 ⓒ It occurs under certain conditions.

28 ⓒ Presence of inhibitors.

29 ⓑ

30 ⓑ

As the optimal temperature for the action of DNA polymerase enzyme that is extracted from the bacteria which live in hot springs ranges between (85°C : 95°C), so that the enzyme's activity increases by increasing temperature and decreases gradually after reaching the optimal temperature of its action (85°C : 95°C), therefore the correct answer is ⓑ as the enzyme didn't reach the optimal temperature in the illustrated graph.

31 **(1)** ⓑ Pepsin – Stomach.

(2) ⓓ Acidic – Basic.

(3) ⓒ Changing the pH value.

(4) ⓐ Hydrogen ion concentration that is suitable for the enzyme action.

32 ⓒ

33 **(1)** ⓐ Starch.

As amylase enzyme hydrolyzes starch into maltose sugar at temperature 37°C, and on putting the enzyme at a temperature higher than the optimal temperature of its action, its action stops due to the change in its natural structure, so that the solution contains starch that has not been hydrolyzed.

(2) ⓐ Starch.

As on putting the solution containing starch in a water bath whose temperature is 35°C, this results in remaining the solution as it is (starch solution), as the natural structure of the enzyme changed during heating at temperature 55°C, as increasing the temperature higher than the optimal temperature of the enzyme's activity leads to changing its natural structure that can't restore its activity again after decreasing the temperature.

34 ⓐ The activity of enzyme (3) increases and the reaction products increase.

As the pathway of the chemical reaction shows that enzyme (3) whose substrate is substance (Y), So, the activity of enzyme (3) increases, the speed of enzymatic reaction increases then the reaction products increase.

35 ⓒ The best result for starch digestion at temperature 30°C after passing 40 seconds.

36 ⓒ The number of substrate molecules which aren't bound to the enzyme is large.

As at point (X), all enzyme's molecules aren't bound to all the substrate's molecules, therefore the concentration of products is low (i.e. the number of unattached substrate's molecules with enzyme at this point is large).

37 **(1)** ⓐ Curves (1) & (4).

(2) ⓓ Curves (3) & (5).

38 ⓐ When temperature rises from 25 to 35°C, the rate of maltose sugar production increases.

39 ⓑ (B) is an enzyme, (C) is a protein and (A) is amino acids.

As during the decomposition of protein (substrate), the concentration of amino acids (reaction products) increases with timing and the concentration of protein decreases gradually without affecting the concentration of enzyme. So, we find that figure (A) refers to the amino acids, figure (B) refers to the enzyme, while figure (C) refers to protein.

40 ⓑ Enzymes are damaged by rising temperature.

41 ⓑ

As stomach "site (Y)" can't perform the digestion process in case of occurring a disturbance that leads to the inhibition of its secretion, and the medium remains weak alkaline, therefore the graph becomes as shown in answer ⓑ

42 ⓒ Adding iodine solution.

43 ⓐ By stopping the activity of enzymes that lyse the cells.

44 ⓑ Enzymes increase the speed of certain reactions.

Second Answers of Miscellaneous Questions

1 Starch formation process from the glucose molecules resulted from the photosynthesis process.

---

2 As the chemical reactions in the cell occur by using the enzymes that work on decreasing the activation energy through reducing the cell consumption of more energy during the reactions, and ensuring the occurrence of chemical reactions rapidly.

---

3 **(a)** • Solution (X) contains : Amylase enzyme and buffer solution (pH = 7.5).

• **The importance of the enzyme :**
- Reducing the activation energy needed to start the reaction.
- Ensuring the occurrence of chemical reaction rapidly.

• **The importance of buffer solution :**
It keeps the pH constant at certain value.

(b) Using buffer solution with suitable pH value (PH =7.5), suitable temperature and the absence of inhibitors / The enzyme's activity will decrease gradually.

(c)

	Substances (X) "Enzymes"	Catalysts
Similarity :	Both of them participate in the chemical reactions inside the cell to speed them up without being affected or consumed.	
Difference :	They are highly specific, as each enzyme is specific for : - One reactant called substrate (S). - One type or a few types of reactions.	They are less specific.

4 (a)

	Enzyme (1)	Enzyme (2)
1	10°C	20°C
2	40°C	40°C
3	50°C	70°C
4	10°C : 50°C	20°C : 70°C

5. The enzyme's concentration, substrate's concentration, hydrogen power (pH) and presence of inhibitors.

"*Two factors are enough*"

(b) Because they consist of protein substances.

5 To provide the optimal temperature at which the enzymes present in these detergents work with a maximum efficiency.

6 The activity of amylase enzyme will stop completely, but it will restore its activity again by increasing the temperature.

7 **(a)** 25°C

(b) (10 : 35)°C

(c) • (3) : 2.5 / Acidic.

• (4) : 8 / Alkaline.

(d) • (3) : Pepsin enzyme / Stomach.

• (4) : Trypsin enzyme / Small intestine.

8 **(a)** Bread (an example for carbohydrates).

(b) Meat (an example for proteins).

9 **The statement is wrong** / As pepsin enzyme works in the stomach and doesn't work in the small intestine.

10 The pepsin enzyme's activity will decrease gradually in the stomach, till it stops.

11 **The statement is wrong** / As trypsin enzyme needs an alkaline medium whose pH is (8), in order to work with a maximum efficiency.

12 **The statement is wrong** / As it is necessary to provide the factors that help to speed the enzyme's action, which are : temperature – hydrogen power (pH) – enzyme's concentration – substrate's concentration.

13 **(a)** The enzyme's action will stop / As a result of the decrease in hydrogen power value below the optimal value for the enzyme's action, where salivary amylase enzyme works in a weak alkaline medium.

(b) The enzyme's action will stop / As a result of the increase in hydrogen power value above the optimal value for the enzyme's action, where pepsin enzyme works in an acidic medium.

14 **The statement is correct** / As metabolism includes anabolic and catabolic processes, where in the catabolism, the chemical bonds among the atoms of macro-molecules are broken to extract the chemical energy stored in them, while in the anabolism, the simple molecules are used to form more complex compounds through a chain of reactions that consume energy.

15 **(a)** • (1) : Digestion process.

• (2) : Catabolism.

• (3) : Anabolism (Polymerization).

(b)

	Process (2)	Process (3)
Site of its occurrence :	Inside the body cells.	Inside the liver and muscle cells.
Importance :	Obtaining the energy required for performing the vital processes in the cell.	Storage of energy.

(c) As the anabolic process no. (3) in which energy is consumed, in order to form many complex compounds from simple molecules through a chain of reactions, and this energy is produced from the catabolic process no. (2).

(d) Carbohydrates are digested in the digestive system into monosaccharides which are used by the body in the energy production processes inside its cells, and this occurs through glucose oxidation in the mitochondria, where the energy stored in the chemical bonds that are present in glucose molecule is released to be stored in ATP compounds, therefore they move to other places in the cell to use the energy stored in them to accomplish all the vital processes, and the excess of glucose sugar is stored in the form of glycogen in the muscles and liver cells.

16 Enzyme (B) / As the thermal range of enzyme action is from (30°C : 100°C) , therefore it can be used in cleaning the very dirty clothes that need a high temperature as the white clothes without losing the enzyme's activity.

17 Tube no.(4), due to the availability of all suitable conditions for the enzyme's action, where the amylase enzyme works efficiently at optimal pH value that equals 7.5 and optimal temperature that equals (37°C), in addition to the absence of inhibitors .

18
- **The scientific error :** is the return of the enzyme's activity, after decreasing the medium's temperature below the optimal value.
- **The explanation :** as on increasing the temperature than the optimum temperature, the enzyme's activity decreases gradually, till it reaches a certain temperature at which the enzyme's activity will stop completely, due to the occurrence of a change in its natural composition (denaturation), and it will not return to its activity again by decreasing the temperature.
- **The correct figure :**

It stops and never returns by decreasing the temperature ← Medium's temperature increases above the optimal temperature — **Enzyme** — Medium's temperature decreases below zero → Its activity stops and returns by increasing the temperature

19 **(a)** 1. Z 2. L 3. X

(b) Using equal amounts of the same concentrations of substrate (hydrogen peroxide) and enzyme (catalase enzyme), fixing the hydrogen power value (pH) and the absence of inhibitors, to illustrate the effect of different temperatures on the speed of the enzyme action.

20 **(a)**
- In the test tube no. (1), the digestion occurs in better.
- Due to the presence of protein (substrate) at suitable hydrogen power value (acidic) and suitable temperature (37°C), and these conditions are suitable for the enzyme's action (pepsin enzyme).

(b) The digestion processes don't occur in the other test tubes, due to the absence of conditions required for the pepsin enzyme's action, such as the differences in pH value and temperatures of the media.

21 (10 mL) of diluted HCL acid / Because trypsin enzyme works efficiently in alkaline medium.

Answers of New Types of questions

1 ⓑ The water bath temperature is 55°C / The water bath temperature is 37°C

ⓓ The pH value equals 8 / The pH value equals 2

2 **(a)** Weak alkaline.
(b) Strong acidic.

Answers of Test on Chapter 3

1 ⓒ Increasing the monosaccharide concentration.
2 ⓒ Catalyst.
3 ⓓ
4 ⓓ He used a lower concentration of the substrate.
5 ⓑ The conversion of glucose into carbon dioxide, water vapour and energy in the muscular cells.
6 ⓐ (1).
7 ⓒ (3).
8 ⓓ (4).
9 ⓒ 0.3
10 ⓓ 0.6

11 As biochemical reactions need a high activation energy to be started. So, they are occurred in the presence of enzymes to reduce the cell consumption of more energy (i.e. enzymes reduce the activation energy) and also enzymes are highly specific than other catalysts for reactants and reactions.

12 **The statement is wrong** / As metabolic processes occur in all the body cells and their stop leads to the death of the living organism, where the metabolic processes are necessary for the body cells to get energy to perform all their activities (catabolism) and also for growth, building and repair (anabolism).

13 Because pepsin enzyme works in an acidic medium at pH = (1.5 – 2.5) "optimal pH" as in stomach, while the pH value in small intestine is basic ranging from (7.5 – 8). So, the change of pH of the medium leads to the stop of the enzyme's action.

14 Carbohydrates will be digested into monosaccharides, which are used by the body cells in the energy production processes inside its cells, and this occurs through the glucose oxidation in the mitochondria, where the energy stored in the chemical bonds that are present in glucose molecule is released to be stored in ATP compounds inside the mitochondria "this is called catabolism", then they move to other places in the cell to use the energy in them to accomplish all the vital processes and the excess glucose is converted into glycogen to be stored in the liver cells and muscles "anabolism process". And also used for building cells, such as that which enter in the structure of cell membranes and cell protoplasm.

15 **Factors that affect the fermentation process :**

1. The amount of milk (substrate).
2. The concentration of bacteria (containing enzymes).
3. Temperature at 37°C – 40°C (optimum temperature for the reaction).
4. Suitable pH value.
5. The absence of inhibitors.

16 Nothing will occur, because the enzyme in the reaction is consumed with its substrate to form enzyme-substrate complex, and the reaction stops.

17 ⓓ

Because temperature is low that leads to decreasing the enzyme's activity, where the enzyme works with a maximum efficiency at the optimum temperature that often ranges between 37°C to 40°C for most enzymes.

Answers of Exercise on Unit 1 from the Questions of the Previous Year Exams

1 ⓒ two maltose and a polysaccharide consists of 5 glucose molecules.

2 ⓒ Anabolic reaction of conjugated protein.

3 ⓒ Nitrogenous base / Pentose sugar / Phosphate group.

4 ⓑ By increasing enzyme's molecules.

5 ⓒ (3).

6 ⓒ (X).

7 ⓓ inhibiting the enzyme.

8 ⓐ carbon

9 ⓑ Covalent & peptide bonds.

10 ⓓ 54

11
- AB : Intermediate compound.
- C + A : Products of the reaction + Enzyme

12
- Figure (1) represents the building unit of the nucleic acid DNA, because this nucleotide contains deoxyribose sugar (which lacks an oxygen atom than the ribose sugar).
- Figure (2) represents the building unit of the nucleic acid RNA, because this nucleotide contains ribose sugar.

13 The arrangement is : (B) ⟶ (A) ⟶ (C)

14 **(a)** • Compound (Z) represents starch.

- **Explanation :** As starch is a complex sugar (polysaccharide), so that it is insoluble in water, because from the properties of complex sugars is that they are insoluble in water.

(b) • Compound (Y).

• **Explanation :** As compound (Y) represents a monosaccharide (glucose), where the monosaccharide (glucose) plays a role in energy production. So, it is oxidized inside the mitochondria which is the place inside the cell where the energy stored in the form of ATP molecules.

15 • The number of dipeptides is 400 compounds.

• **Explanation :** As there are 20 standard amino acids, and we know that the dipeptide compound is formed from the combination of two amino acids. So, there are 20 probabilities for the first amino acid and also there are other 20 probabilities for the second amino acid. Therefore, to calculate the number of different dipeptide compounds that can be made $= 20 \times 20 = 400$ dipeptides.

16 The orange colour of iodine solution turns into dark blue, because grinded rice contains starch. So, the iodine solution is used for detecting the presence of starch in various types of food.

17 Nothing will happen, because the human body temperature is (37°C), where the enzyme that is found in bacteria whose optimal temperature to work efficiently is much higher than the human body temperature (nearly 75°C) and can start working at 40°C. So, the activity of this enzyme stops.

UNIT 2

Answers of Chapter 1

First Answers of Multiple Choice Questions

1 ⓑ The presence of nuclei. 2 ⓐ

3 ⓒ Van Leeuwenhoek. 4 ⓑ

5 ⓒ Schwann. 6 ⓐ Virchow.

7 ⓓ The cell is the basic unit for life.

8 ⓒ The division of mitochondrion during the cellular division.

As from the cell theory principles that all the living cells come from other pre-existing living cells. So, when each of *Amoeba*, yeast fungus and bacteria cells divide during the asexual reproduction, other cells are produced that contain the same content of the original cell and do the same functions, while the cell theory doesn't include the division of mitochondria as a component of the cell during the cellular division.

9 ⓒ Virchow.

10 ⓒ Schleiden.

As these figures show that they represent plants. Therefore, they have the same building unit (plant cell). This is proved by the scientist Schleiden who is the first scientist that stated all plants are composed of cells.

11 ⓑ

As by increasing the magnifying power of the used lenses in the light microscope, the number of appeared cells decreases, i.e. the relationship is inversely proportional.

12 ⓐ Bacterial cell.

13 ⓒ The wavelength of the electrons beam is shorter than that of the light beam.

14 ⓒ (Z).

15 ⓒ The scanning electron microscope with magnifying power reaches 3500x

16 ⓒ transmission electron microscope.

17 ⓒ It provides a possibility to see the tissues.

18 ⓓ 400 times.

19 ⓑ Transmission electron microscope / Scanning electron microscope

20 ⓑ 10×100 21 ⓓ 20

22 ⓒ Prokaryotic organisms are originated from complex organisms.

23 ⓐ 5x / 10x

As there is an inverse relationship between the magnifying power of the compound microscope and the number of cells that can be seen, therefore the least magnifying power allows seeing the largest number of cells in the plant tissue.

∵ The magnifying power of compound microscope = Ocular lens magnifying power × Objective lens magnifying power

∴ The least magnifying power $= 5 \times 10 = 50x$

24 ⓑ Plasma membrane.

As plasma membrane of the plant cell can't be seen and differentiated by the light microscope, but it can be differentiated by the electron microscope, while the cytoplasm, nucleus and cell wall can be seen by the light microscope as in onion plant cells.

25 ⓐ He added a dye on the specimen.

26 ⓓ Using the magnifying power of the microscope = 2500x

27 ⓓ One million times.

28 ⓒ Transmission electron microscope.

29 ⓑ

As the more increase in the wavelength of the used beam, the more decrease in the contrast degree, i.e. the relationship is inversely. So, we find that the formed image by the electron microscope is highly contrasted comparing with that formed by the light microscope, this is because the wavelength of the electrons beam is shorter than that of the light beam.

30 ⓒ Using an objective lens with a higher magnifying power.

31 ⓑ 100 times.

As the image that has been obtained is with a magnifying power equals 1000 times that is formed when the magnifying power of the objective lens = 100 times and that of the ocular lens = 10 times. So, by using the following equation :

Magnifying power of the objective lens

$$= \frac{\text{Magnifying power of the microscope}}{\text{Magnifying power of the ocular lens}}$$

$$= \frac{1000}{10} = 100 \text{ times}$$

32 ⓓ Transmission electron microscope.

33 ⓒ Scanning electron microscope.

As the scanning electron microscope is used in studying the cell surface. So, we can examine the distribution of flagella on the surface of some types of bacteria that they use them as a locomotion mean, where they extend from the outer surface of bacteria.

Second Answers of Miscellaneous Questions

1 • **Figure (1) :** Robert Hooke simple microscope / It is used to examine a piece of cork tissue and found that it is composed of small boxes each one of them called "cell".

• **Figure (2) :** Van Leeuwenhoek simple microscope / It is used to examine different substances, such as pond water containing microscopic organisms, blood tissue and others.

2

The building unit of the nervous system	The building unit of the muscular system
• The nerve cell is the longest cell.	• The muscular cell is cylindrical and long cell.
• The nerve cell transmits the messages from the spinal cord inside the vertebral column to the responding organs (such as : toes).	• The muscular cell has the ability to contract and relax, helping the animal to move free.

3 Because the dyes kill *Amoeba*, as from the disadvantages of using dyes that they kill the living specimens.

4 The image of the tissue will become unclear (blurred).

5 **(a)** The second slide "smear from the lining membrane of the mouth" / As pond water sample contains micro-organisms and from the disadvantages of the dyes is that they kill the living specimens, so that it is not preferred to add dyes for this slide that was taken from pond water sample, because the dyes cause the death of the living organisms found in the sample (such as *Amoeba* and *Paramecium*), while the dyes are used to stain or colour certain parts to make the image more clear.

(b) From the precautions to examine the specimens more clearly : the increase in the contrast among different parts of the specimen by :

1. Changing the level of lighting (light intensity).
2. Using dyes, where these dyes are used to stain certain parts of the specimen to be more clear (as in case of the slide preparation of lining membrane of the mouth, avoiding the addition of dyes on examining the specimens of unicellular organisms, such as *Amoeba*, *Paramecium* and also yeast fungus, because they kill the living specimens.

6 The specimen becomes more clear on its examining, due to the staining of certain parts of it. So, the contrast increases among its different parts, but if the specimen is living, these stains will kill it.

7 **The statement is wrong** / Because the nerve cell transmits the messages (nerve impulses) from the skin (receptor organ) to the spinal cord that is present inside the vertebral column, then to the muscles (responding organ).

8 **The statement is wrong** / As according to the cell theory, this is not agreed with the discovery of Virchow, where the new living cells (worms) are originated from other pre-existing living cells (worm's eggs) and not originated from meat itself.

9 **The statement is wrong** / As according to the cell theory, this is not agreed with the discovery of Virchow, where all living cells come only from other pre-existing living cells by the cellular division not spontaneously from non-living matter.

10 **(a)** (2) Scanning electron microscope.

(b) (3) Transmission electron microscope.

(c) (1) Compound light microscope.

Answers of New Types of questions

1 ⓐ (1).
ⓓ (2).

2 ⓐ The microscope magnifying power = 2000 times
ⓓ The image will be unclear.

Answers of Test on Chapter 

1 ⓒ Schleiden.

2 ⓑ (40x).

3 ⓓ Virchow.

4 ⓒ Because he was the first who examined a plant tissue and found that it is consisting of cells.

5 ⓒ Schleiden.

6 ⓓ Transmission electron microscope.

7 ⓒ New cells are formed from the cellular division.

8 ⓑ

9 ⓒ (50x).

10 ⓑ (2) and (3).

11 **The statement is wrong** / As the living organisms are divided into unicellular organisms whose bodies consist of one cell only which performs all the vital activities needed for the continuity of life like *Amoeba*, bacteria and *Paramecium*, and multicellular organisms whose bodies consist of many cells which differentiate and specialize in their functions like human, whale and trees. According to the cell theory all living organisms are made up of cells which may be single or grouped in clusters.

12 As in electron microscope, the images are highly magnified and highly contrasted comparatively with those produced by the light microscope, due to the short wavelength of the electronic ray comparatively with that of the light ray (i.e. the more decrease in the wavelength, the more increase in the contrast of the image (inverse relationship).

13 **Because the electron microscope can :**

- Magnify objects one million times or more of their real sizes (i.e. its magnifying power is more than the magnifying power of the light microscope which magnifies objects up to 1500 times of their real sizes).
- Clarify the cellular components that had not been known before and know more accurate details about the cellular structures that had been known before.
- Form a highly magnified and highly contrasted image comparatively to those produced by the light microscope.

14 *Amoeba* will die, because eosin is a dye, where the dyes cause the death of the living specimens. So, we can't see the division of *Amoeba*.

15 No / As the dyes (stains) kill the living specimens. So, it is not preferred to add dyes on examining the specimens of unicellular organisms, such as *Amoeba*, *Paramecium* and also yeast fungus.

16 The three scientists whose efforts help to arise the cell theory are :

- Schleiden : as he deduced that all the plants are composed of cells and he stated his deduction depending on his own researches and those of other previous scientists.
- Schwann : as he deduced that the bodies of all living organisms are composed of cells.
- Virchow : as he stated that the cell is the functional and building unit of all living organisms and he emphasized that the new cells are originated only from other pre-existing living cells.

17
- It consists of one cell which represents the functional and building unit of it.
- This cell performs all the vital activities needed for the continuity of its life.
- It is originated form other pre-existing living cell (parent cell).

Answers of Chapter 2 Lesson One

First Answers of Multiple Choice Questions

1 ⓓ Cellulose only.

2 ⓑ The separation between the cell contents and the surrounding medium.

3 ⓑ Phospholipids.
As the plasma membrane prevents the spread of protoplasm out the living cell, and it plays a main role in regulating the passage of substances from and to the cell, where the plasma membrane consists mainly of two layers of phospholipids that keep the plant cell from losing its vital properties.

4 ⓑ Through binding heads to water.

5 ⓑ Through the plasma membrane proteins.
As from the functions of the plasma membrane proteins is that some of them work as sites for recognizing the different substances like hormones.

6 ⓐ Phospholipid.

7 ⓒ

8 ⓓ Through hydrophobic tails.

9 ⓐ ✓ / ✓ / ✓

10 ⓒ RNA

11 ⓒ Chromosome with duplicated chromatids.

12 **(1)** ⓐ (1).
(2) ⓑ (2).
(3) ⓑ Proteins and DNA
(4) ⓐ Proteins.

13 ⓓ 20
As during the metaphase of mitotic division, the chromosome contains two DNA molecules, therefore the cell of this living organism contains 20 DNA molecules to become the number of chromosomes at the end of division in each cell separately is 10 chromosomes like the original cell.

14 ⓑ
As there may be more than one nucleolus present inside the cell's nucleus, especially in the cells specialized in the formation and secretion of protein substances like enzymes, therefore as the secretion activity of the cell increases, the number of nucleoli inside the cell's nucleus increases, i.e. the relationship is direct.

15 ⓒ (3).

16 ⓒ Figure no. (1) controls the synthesis of figure no. (3) inside figure no. (2).

17 ⓑ Phospholipids / Fats.
As phospholipid molecule contains two fatty acids in its structure, where one of them is saturated fatty acid and the other is unsaturated fatty acid. So, it makes the molecule in liquid state, while the fats contain saturated fatty acids which make them solid at room temperature.

18 **(1)** ⓐ Carbohydrates.
(2) ⓐ Glucose.
(3) ⓑ Nucleus.

19 **(1)** ⓐ (1).
As some protein molecules work as gates for regulating the passage of substances from and to the cell.
(2) ⓒ homogenous and heterogeneous

20 ⓒ Size of molecules.

21 ⓐ ✓ / ✓ / × / ✓ / ✓

22 ⓒ Through hydrophilic heads.

23 ⓑ ✓ / ✓ / ✓ / ×
As RNA molecules pass through the nuclear membrane pores that are transcribed from DNA which is responsible for the synthesis of proteins in the cell as enzymes that regulate the biochemical reactions that occur inside the living organism's cells which is known as metabolism, where it includes anabolic reactions the synthesis of carbohydrates, proteins and fats, where they are synthesized by polymerization reactions (anabolism) or vice versa as the previous polymers are converted into monomers (building units) through catabolic reactions by the action of enzymes. Therefore, the formation of all illustrated substances in the table is affected by the absence of nuclear membrane pores.

24 ⓑ Protein and DNA
As the chromosome consists of DNA nucleic acid wrapped around protein molecules that are called by histones.

25 Stomach lining.

Second Answers of Miscellaneous Questions

1 Because of the presence of cell wall that allows the passage of dissolved substances in soil solution easily through it, as the cell wall is characterized by being pitted.

2 The water will transfer to the cell with large amounts more than its need, leading to the rupture of the cell membrane and its death.

3 *Answer by yourself.*

4 The cholesterol substance (lipid derivative) in the cell membrane acts on maintaining the membrane cohesive and intact.

5 The passage of substances from and to the cell will not be organized and also the protoplasm will spread outside the cell, leading to the cell death.

6 • The cell can't recognize the different substances, such as : nutrients, hormones and others that are needed by the cell. Therefore, the cell loses its ability to connect with the external environment and dies.

• The cell can't control in the passage of substances from and to the cell, where some protein molecules work as gates for the passage of substances from and to the cell.

7 The plasma membrane will not become cohesive (become loose) and the cell loses its ability to perform its vital activities, causing the damage of the cell.

8 **(a)** (1) Cell wall.
(b) (3) Plasma membrane (Cell membrane).
(c) (4) Nucleus.
(d) (5) Cytoplasm.

9 Chromatin is changed into rod-shaped structures called chromosomes during the cell division, where each chromosome consists of two filaments of chromatid.

10 **The statement is correct** / As the nucleus contains chromatin which is changed into rod-shaped structures called the chromosomes during the cell division where each chromosome consists of DNA carrying the genetic information (genes) which are responsible for the appearance of the genetic traits of the living organism.

11 The membrane will be coiled around itself and it will not surround the cell, therefore the cell contents will scatter and the cell loses its ability to do its vital functions.

12 Phospholipid.

13 Each of the two structures (1) and (2) can't replace each other / Because if the structure no. (1) replaces the structure no. (2), the facing part to the cell from the outside becomes hydrophobic tails, therefore the water can't enter into the cell. So, the cell will shrink, lose its function and die.

14 **The statement is correct** / Due to the presence of tiny pores in the nuclear membrane through which the nucleic acid RNA passes after its transcription from DNA inside the nucleus to the cytoplasm to be used by the cell in the protein synthesis.

15 **(a)** The structure no. (1) "Chromatin" during the cell division is changed into rod-shaped structures called chromosomes, as each chromosome consists of two filaments, each one of them is called chromatid that consists of nucleic acid (DNA) coiled around the molecules of protein, where DNA carries the organized genetic information (genes) that controls the shape and the structure of the cell.

(b) The structure no. (2) "Nucleolus" is present abundantly in the nucleus of the cells specialized in the formation and secretion of protein substances, such as some hormones.

Answers of New Types of questions

1 **(a)** It surrounds the plant cell only / It surrounds the plant and animal cells.

(b) It allows the passage of dissolved substances / It prevents the spreading out of protoplasm outside the cell.

2 **(a)** Amino acids
(b) 2 Fatty acids + phosphate group + choline group + glycerol

Answers of Chapter 2 Lesson Two

First Answers of Multiple Choice Questions

1 ⓐ Cell membrane.

2 ⓐ Centrosome.

3 ⓓ Centrosome.

As the centrosome performs an important role during cell division, where the spindle filaments extend between the two centrioles that are present at each pole of the cell poles and withdraw the chromosomes towards the cell poles, which helps in the cell division into two cells and leads to increasing the number of cells.

4 ⓑ Cytoplasm.

5 ⓒ Centrosome.

As the centrosome works on forming the flagellum (structure X) which helps in the organism's locomotion that illustrated in the figure.

6 ⓐ

As the smooth endoplasmic reticulum converts the glucose into glycogen which is stored in liver cells, and by increasing the activity of this organelle, the glycogen level in liver increases (i.e. it is an inversely proportional relationship).

7 ⓓ DNA

8 ⓒ Energy production.

9 ⓓ Smooth endoplasmic reticulum.

10 ⓑ Endoplasmic reticulum.

11 ⓐ Liver and muscles.

12 ⓒ Z

13 ⓐ Smooth endoplasmic reticulum.

14 **(1)** ⓐ Synthesis of protein in the cell.
(2) ⓒ Synthesis of lipids in the cell.

15 ⓓ proteins.

16 ⓒ White blood cell.

17 ⓐ Nucleus and cytoplasm.

18 ⓐ The two statements are correct.

19 ⓑ Sap vacuole.

20 ⓐ

21 ⓒ Getting rid of microbes.

22 ⓑ Lysosomes.

23 ⓒ Ribosome.

24 ⓒ The digestive enzymes decompose the damaged mitochondria.

25 ⓒ (Z).

26 ⓑ Cell wall.

27 ⓑ catabolism in the mitochondria

28 ⓓ ✓ / × / × / ✓

29 ⓓ Cytoplasm microtubules.

30 ⓑ DNA exists inside and outside the nucleus.

31 ⓒ Lysosome.

32 ⓒ Lysosomes.

33 ⓒ Golgi body.
As the number of Golgi bodies increases according to the secretion activity of the cell, which characterizes the adrenal gland cells with hormonal secretion.

34 ⓑ The stop of transferring substances from a place to another in the cell.

35 ⓓ Centrosome.

36 ⓒ Liver.

37 ⓐ Simple lipids.

38 ⓒ The oxidation of glucose.

39 ⓑ Orange fruits.

40 **(1)** ⓒ (5). **(2)** ⓐ (1).
(3) ⓐ (1) and (4). **(4)** ⓑ (2) and (5).
(5) ⓑ (3).

41 ⓑ Ribosome.

42 ⓒ Rough endoplasmic reticulum → Transporting vesicles → Golgi body → Secretory vesicles.

43 **(1)** ⓓ Small intestine cell.
(2) ⓑ Muscular cell.
(3) ⓑ Hepatic cell.
(4) ⓑ White blood cell.

44 ⓐ Mitochondrion.

45 ⓒ The lack of the secretory vesicles content of enzymes that are responsible for fats breakdown.
As the lysosomes (secretory vesicles) play an important role in the digestion of substances which are engulfed by the cell and converting them into structurally simpler form, to make the cell get benefit from them, therefore the decrease in the amount of lysosomal enzymes that are required for the fats digestion (breaking down) led to their accumulation and causing the disease.

46 ⓓ The exit of ATP molecules from the mitochondria during the cellular respiration process.

47 ⓒ ADP molecules and phosphate groups.

48 ⓑ Smooth endoplasmic reticulum.

49 ⓐ The ribosomes that exist on the endoplasmic reticulum.

50 ⓑ Glucose / O_2 / Enzymes / ATP

51 ⓒ Golgi apparatus.

Second Answers of Miscellaneous Questions

1 As ribosomes synthesize the proteins which are used by the cell in its vital processes, such as growth, regeneration and others.

2 Proteins.

3 **The statement is wrong /** As the centrosome plays an important role in the cell division, while lysosomes don't have a role during the cell division.

4 20 centrioles / As the centrosome consists of 2 centrioles, and each hepatic cell contains 1 centrosome. So, the number of centrioles $= 2 \times 10 = 20$ centrioles.

5

P.O.C.	Centrosome	Centromere
Location :	It is found in animal cells (except nerve cells) and some fungi near the nucleus.	It is found between the two chromatids of chromosome inside the nucleus.
Function :	It plays an important role during cell division and in the formation of flagella and cilia.	It is the point of connection between the two chromatids to form a chromosome.

6 **The statement is wrong** / As they are found gathered in one big vacuole or more for storing water and nutrients or storing wastes of the cell, until it gets rid of these wastes.

7 **The statement is correct** / As the smooth endoplasmic reticulum synthesizes lipids inside the living cell.

8 Because the stomach lining cells and endocrine glands' cells are responsible for the secretion of enzymes and hormones (proteins), where the rough endoplasmic reticulum synthesizes the protein in the cell.

9 As liver cells contain smooth endoplasmic reticulum in abundance that works on :
- The conversion of glucose sugar into glycogen that is stored in the hepatic cells.
- The conversion of some toxic chemical compounds into less toxic ones.

10 **The statement is correct** / As the rough endoplasmic reticulum synthesizes the proteins in the cell. So, it produces the hormones that consist of proteins, such as the thyroxine hormone (thyroid gland protein) and the smooth endoplasmic reticulum produces lipids in the cell. So, it produces the hormones that consist of lipids, such as steroids.

11 **(1)** and **(2)** Rough endoplasmic reticulum, Golgi bodies and lysosomes.

(3) : (5) White plastids (Leucoplasts).

(6) : (8) Coloured plastids (Chromoplasts).

(9) : Lysosomes.

12 **(1)** As Golgi bodies are specialized in receiving the molecules of substances that are secreted by the endoplasmic reticulum through a group of transporting vesicles, then Golgi bodies classify these substances and modify them, then distribute them into the places where they are used inside the cell or they may pack them inside the secretory vesicles.

(2) As the number of Golgi bodies differs according to the activity of the cell secretion. So, the Golgi bodies are present in the glandular cells in large numbers, such as the cells of the thyroid gland, but they are found in lower numbers in the other cells, such as the skin cells.

(3) As the number of adenosine triphosphate compounds (ATP) increases in the muscular cell than that in the skin cell, due to the increase of the mitochondria number that is present in the muscle compared to the skin cell.

13 **(1)** The secretion of enzymes and hormones from the glandular cells decreases.

(2) The cell will be lyzed, as a result of releasing the digestive enzymes from the inside lysosomes to the cytoplasm.

(3) The cell will not be able to digest the nutrients that are engulfed by the cell and convert them into structurally simpler substances which the cell can make benefit from them. Also, the senile and worn out cells and organelles that are useless to the cell will be accumulated, and the cell becomes exposed to the invasion of microbes.

(4) White blood cells will not be able to attack and destroy the foreign bodies and microbes that attack the body.

(5) The cell will not be able to produce energy that is required to accomplish its vital processes and may die.

14 **The statement is wrong /** As leucoplasts don't contain chlorophyll pigment that is responsible for the photosynthesis process to form the glucose sugar.

15 **(1)**

	Sweet potato root cells	Strawberry fruit cells
Similarity :	Plant cells.	
Difference :	They contain leucoplasts (white plastids).	They contain chromoplasts (coloured plastids).

(2) *Answer by yourself.*

16 **(a)** • **Cell (1) :** Plant cell / Due to the presence of cell wall and chloroplast.

• **Cell (2) :** Animal cell / Because it doesn't contain cell wall and doesn't contain chloroplast.

(b) Red blood cell.

17 Lysosomes / As lysosomes get rid of worn out and senile cells and organelles which are useless to the cell, digest and damage the microbes (pathogens) that invade the cell. (i.e. they protect the cell).

18 Ribosomes – Rough endoplasmic reticulum – Golgi bodies – Lysosomes.

19 **The pathway of the insulin hormone production :** Ribosomes → Rough endoplasmic reticulum → Transporting vesicles → Golgi bodies → Secretory vesicles → Membrane of beta cell in pancreas $\xrightarrow[\text{the blood to}]{\text{arrives across}}$ Target cell.

20 (A) / Because of the increase in the number of folds (cristae) that act on increasing the inner membrane surface area on which the chemical reactions that produce energy take place.

21 **(a)** **(1)** Rough endoplasmic reticulum.

(2) Golgi body.

(3) Lysosomes (Secretory vesicles).

(b) **The pathway of the digestive enzymes :** Rough endoplasmic reticulum → Transporting vesicles → Golgi bodies → Secretory vesicles → Cell membrane of a fungal cell (exocytosis).

22 As seeds contain stored food (starch) that the embryo uses for its growth and differentiation under the soil surface, till their leaves are formed, that contain the required chlorophyll for performing the photosynthesis process in the plant.

23 **(a)** **(1)** Rough endoplasmic reticulum.

(2) Golgi body.

(3) Lysosome.

(b) The organelles (1) and (2) are found in abundance in the glandular cells, such as the stomach lining cells and the endocrine glands' cells.

(c) **(A)** Proteins.

(B) Digestive enzymes.

Answers of New Types of questions

1 ⓑ Rough endoplasmic reticulum.

ⓓ Golgi bodies.

2 **(a)** (2).

(b) (1).

Answers of Test on Chapter 2

1 ⓒ A fungal cell.

2 ⓒ Performing photosynthesis process.

3 ⓓ Bean plant leaf.

4 ⓒ The presence of centrosome.

5 ⓑ Smooth endoplasmic reticulum.

6 ⓐ Lysosomes.

7 ⓐ (1).

8 ⓑ Ribosomes.

9 ⓒ It regulates the passage of substances from and to the cell.

10 ⓐ It acts on supporting the bacterial cell.

11 The plant cells will not be able to store water and nutrients and can't get rid of wastes. So, this leads to the death of the cell.

12 Cell (A) / Because of increasing the number of cristae (folds) that work on increasing the inner surface area on which the chemical reactions that produce energy take place.

13 As the chromosome consists of two filaments called chromatids joined together by the centromere, where each chromatid is composed of the nucleic acid DNA (1st polymer) wrapped around proteins called histones (2nd polymer).

14 No / As the cell can't perform its functions, the protoplasm will spread outside the cell and the cell membrane will not become cohesive (become loose) and intact, because the phospholipids and proteins play an important role in regulating the passage of substances to and from the cell and prevent the spreading out of protoplasm.

15 Cell (B) / As cell (B) contains larger number of lysosomes, where the white blood cell uses the digestive enzymes that are present inside the lysosomes to digest and destroy the pathogens which invade the cell.

16 As cytoplasm contains a region that performs the same function of centrosome as in the cells of plants, algae and most fungi and also contains the cytoskeleton which is a network of threads and microtubules that acquires the cell with a support to help it in maintaining its shape and form, such as in animal cells (it acts as the cell wall in plant cells).

17 **The statement is correct** / As all cells are surrounded by plasma membrane which contains three biological polymers which are phospholipids (complex lipid), cholesterol (lipid derivative), proteins and carbohydrates.

Answers of Chapter 3 Lesson One

First Answers of Multiple Choice Questions

1 ⓓ Mitochondrion.

2 **(1)** ⓑ (X) and (L).
(2) ⓓ (a) and (b) together.
(3) ⓐ (Y).

3 ⓐ Collenchyma and sclerenchyma tissues.

4 ⓒ Companion cells.

5 ⓓ Sieve tubes.
As the products of the photosynthesis process are transferred in the phloem tissue which is composed of sieve tubes that work on transferring the produced nutrients to all the plant parts by the help of the produced energy from the companion cells.

6 ⓓ The type of tissue.

7 ⓒ Z, Y & L

8 ⓑ Tissue no. (1) is a non-living tissue and tissue no. (2) is a living tissue.

9 ⓑ The first statement is correct and the second statement is wrong.

10 ⓓ Tracheids.

11 ⓓ Cell (1) and cell (3).

12 ⓒ The first statement is correct and the second statement is wrong.
As the parenchyma tissue contains green plastids which perform the photosynthesis process and form glucose, as the plant stores the excess glucose in the form of starch in leucoplasts till needed.

13 ⓓ Xylem vessels and sieve tubes.

14 ⓑ Tracheids.

15 ⓐ Parenchyma cell.

16 ⓑ Collenchyma tissue.

17 ⓑ

18 ⓑ Sclerenchyma tissue.

19 ⓒ sieve tubes.
As the presence of sugars in the insect's mouthparts is an indication that the site of piercing is the sieve tubes which work on transferring the nutrients from the leaves to all the plant parts by the help of the produced energy from companion cells.

20 **(1)** ⓓ (4).
(2) ⓒ Parsley stems.

21 ⓑ Xylem vessels are coloured by the same colour of water.

Second Answers of Miscellaneous Questions

1 **The statement is wrong** / As mature tomato fruits don't contain chloroplasts that are responsible for performing photosynthesis process, while they contain chromoplasts that give tomato its characteristic colour.

2 Because the sweet potato roots contain parenchyma tissue whose cells contain leucoplasts that act as the centres for storing starch.

3 **(1)** & **(2)** Parenchyma tissue.
(3) Collenchyma tissue.

4 The support, hardness and elasticity of the plant will decrease.

5 The tissue will lose its ability to perform the aeration process that needed for the plant.

6 As the walls of xylem vessels and tracheids are thickened by lignin substance which supports the plant and provides it with hardness.

7 As xylem transports water and salts from root to stem, then to leaves and also acts on supporting the plant.

8 The cytoplasm will not be able to pass through them to all cells. Therefore, the nutrients will not reach the plant parts, which causes its death.

9 **The statement is correct** / As the phloem tissue transports the nutrients that are resulted during photosynthesis from the leaves to other plant parts.

10 Both of them are non-living plant tissues, where lignin is deposited in the inner surface of their walls from inside for supporting and strengthening the plant.

11 **(1)** Sclerenchyma tissue.
(2) Xylem tissue.

12 **(a)** Figure no. (3).
(b) The stem in figure no. (2).
(c) Figure no. (1).
(d) Figure no. (1).

13 **The statement is correct** / As the companion cells are living cells that provide the sieve tubes with the energy needed to do their function by the mitochondria that are present inside the companion cells, where the mitochondria represent the centres of the energy production in the cell.

14 The production of energy inside the companion cells in the phloem tissue will not occur, therefore the sieve tubes don't get the required energy to perform their function and the transport of nutrients through the sieve tubes will stop, so that the phloem tissue loses its function and the plant dies.

15 **(a)** • **(X)** : Phloem tissue.
• **(Y)** : Xylem tissue.
(b) • **(1)** Sieve tubes.
• **(2)** Companion cell.
(c)

Structure no. (1)	Structure no. (2)
• Non-living cell. • It is devoid of nucleus.	• Living cell. • It contains nucleus.

(d) *Answer by yourself.*

16 As mitochondria represent the centres of energy production in the cells, when mitochondria decrease in the companion cells, the energy that is needed for the sieve tubes to do their functions decreases. Therefore, the efficiency of transporting the nutrients that made by the phloem tissue decreases.

17 **(a)** • **(X) :** Xylem tissue.
• **(Y) :** Sclerenchyma tissue.
• **(Z) :** Collenchyma tissue.
(b) • The importance of tissue (X) : is supporting the plant and transporting water and salts from root to stem then to the leaves.
• The importance of tissue (Y) : is strengthening and supporting the plant and providing it with hardness and elasticity.
• The importance of tissue (Z) : is supporting the plant by providing it with the suitable elasticity.
(c) • **(X) :** Compound tissue.
• **(Y) :** Simple tissue.
(d) Parsley stem.

Answers of New Types of questions

1 ⓐ The photosynthesis process stops.
ⓔ The plant growth stops.

2 ⓒ Transferring simple sugars to all the plant parts.
ⓔ Its cells have no nuclei.

3 **(a)** Xylem vessel.
(b) Tracheid.

Answers of Chapter 3 Lesson Two

First Answers of Multiple Choice Questions

1 (d) Epithelial tissue.

2 (c) Lining of the kidney tubules / Walls of the alveoli

3 (c) (3) and (1).
As the calcium deposition in bones "tissue no. (3)" makes it harder than cartilages "tissue no. (1)".

4 (c) Vascular connective tissue.
As the blood cells transfer gases (oxygen and carbon dioxide) and the blood tissue is considered a vascular connective tissue.

5 (d) Striated voluntary.

6 (a) Epithelial / Connective.
As tissue (X) represents an epithelial tissue that works on secreting the mucus to keep the trachea cavity moist and smooth, and tissue (Y) is a skeletal connective tissue (cartilages) works on supporting trachea.

7 (d) ✓ / ✓ / ✓

8 (c) Muscular tissue.

9 (a) Its cells are long and cylindrical.

10 (c) Alveoli walls.

11 (c) Unstriated involuntary.

12 (d) They contain intercalated discs.

13 (b) Smooth muscular tissues.

14 (c) Skeletal muscular tissues.

15 (d) Animal muscular cells and plant companion cells.

16 (a)

17 (c) Digestive system.

18 (a) Respiratory system.

19 (b)

20 (b) Simple columnar cells.

21 (a) Support.

22 (a) The body length.
As calcium element is necessary for the bone growth in the childhood stage, therefore any disturbance in its amount at this stages will affect the body length negatively.

23 (a) Simple columnar epithelial tissue / Smooth muscles

24 **(1)** (a) (1).
(2) (b) (2).
(3) (c) (3).
(4) (b) (2).
(5) (d) (4).

25 **(1)** (c) Striated involuntary muscles.
(2) (a) Connective tissue.

26 (d) The first statement is wrong and the second statement is correct.

27 (c) The nervous cells aren't regenerated when died.

Second Answers of Miscellaneous Questions

1 To protect the cells which they cover from harms, drought and pathogens (as microbes) as in the skin epidermis.

2 • The heart : consists of cardiac muscles, nervous tissue and connective tissue.
• The walls of blood vessels : smooth muscles.
• The lining of blood capillaries : simple squamous epithelial tissue.
• Blood : vascular connective tissue.

3 **Because the skin consists of :**
• Skin epidermis that contains compound epithelial tissue that is stratified epithelial tissue.
• Skin dermis that contains connective tissue which is connective tissue proper.

4 It will not be able to transport the digested food, gases and the excretory substances.

5 Cartilages will become hard, such as bones.

6 **The statement is wrong** / As there are voluntary muscles in the two legs that can be controlled during their movement. So, they are skeletal muscles not smooth muscles, while the smooth muscles are involuntary muscles that cannot be controlled.

7 Because bones are tissues with hard intercellular substance in which calcium deposits to make them harder, while calcium can't be deposited in cartilages.

8 Because they are usually found attached to the skeleton as in the arm, legs and trunk muscles.

9 **(a)** (2) Smooth muscles.
(b) (3) Skeletal muscles.
(c) (1) Cardiac muscles.

10 **The statement is wrong** / As the nerve cells are responsible for the regulation of the different activities of the body organs, because they are specialized in receiving the internal and external stimuli and conducting them to the brain and spinal cord, then transmitting the motor impulses from one of them to the effector organs (muscles or glands).

11 **(a)** • (X) : Nerve cell.
• (Y) : Muscle cell.
(b) The contraction and relaxation features enable the living organism to move.

12 **(a)** • (1) Simple cuboidal epithelial tissue.
• (2) Simple squamous epithelial tissue.
(b) The part no. (1).

13 **(a)** • The lining of trachea contains an epithelial tissue / It acts on secreting the mucus to keep the cavities of the trachea smooth and moist.
• The cartilaginous rings in trachea contain skeletal connective tissue / For supporting.
(b) Simple squamous epithelial tissue.

14 **(a)** Stratified squamous epithelial tissue.
(b) Connective tissue proper.
(c) Smooth muscles.

15 Figure no. (1) "nerve cell" that is responsible for the regulation of the different activities of the body organs, because it is specialized in receiving both the internal and external sensory stimuli and conducting them to the figure no. (2) "brain", then transmitting the motor nerve impulses from the brain to the effector organs (muscles or glands).

16 **The statement is correct** / As the brain receives the sensory stimuli from inside the cells through the nerve cells, then the nerve cells transfer the motor impulses to the effector organs as glands.

17 **(A)** Cell (A).
(b) Cell (C).
(c) Cell (B).

Answers of New Types of questions

1 ⓐ Brain / Hands muscles.
ⓒ Spinal cord / Lower limbs of muscles.

2 ⓒ Striated muscles.
ⓔ Cartilaginous tissue.

3 **(a)** Smooth muscles.
(b) Simple columnar epithelial tissue.

Answers of Test on Chapter 3

1 ⓒ (3).
2 ⓐ (1).
3 ⓐ (1).
4 ⓓ (4).
5 ⓒ The first statement is correct and the second statement is wrong.
6 ⓒ connective proper
7 ⓓ The contraction and relaxation of unstriated involuntary muscles.
8 ⓐ Parenchyma tissue has a main role in the storage of nutrients.
9 ⓑ Phloem.
10 ⓑ Absorbing the digested food.

11 The type of tissues in :
• Case (1) "flexible fish skeleton" : cartilaginous tissue.
• Case (2) "hard fish skeleton" : bone tissue.

12 **The statement is wrong** / As the xylem tissue is non-living and living tissue, which is responsible for transporting water and salts from the roots to the stem, then to the leaves, while the phloem tissue is a living tissue which is responsible for transporting the nutrients from the leaves to the other plant parts. So, the transport process in the plant depends on living and non-living tissues.

13 Both of them consist of muscular tissues that are made up of muscular cells or muscle fibers and also they are striated muscles.

14 **(a)** Tissue no. (4).

(b) Tissue no. (1).

15 As when removing the phloem, the transport of nutrients to the parts of the plant (tree) is not occurred, leading to the death of the plant, because the phloem is responsible for transporting the nutrients that are resulted during photosynthesis from the leaves to the other plant parts.

16 The cells become more exposed to harms, drought and pathogens (as microbes), because the stratified epithelial tissue protects the cells which they cover against harms, drought and pathogens.

17 The nervous tissue is responsible for receiving the internal and external sensory stimuli and conducting them to the brain and spinal cord, then transmitting the motor nerve impulses from one of them to the effector organs (muscles) to cause the movement of the body.

Answers of Exercise on Unit 2 from the Questions of the Previous Year Exams

1 ⓓ To provide essential nutrition for the cell to carry the genetic information and allow it to be passed from the parents to offspring.

2 ⓐ parenchyma tissue.

3 ⓒ Alveoli walls.

4 ⓒ Unicellular organisms are originated from complex organisms.

5 ⓒ the rising up of a book from the desk.

6 ⓑ Centrosome.

7 ⓒ amino acids and rough endoplasmic reticulum.

8 ⓐ centrosome.

9 ⓒ Companion cells.

10 ⓐ Parenchyma tissue.

11 The magnifying power of the ocular lens

$$= \frac{\text{Magnifying power of the microscope}}{\text{Magnifying power of objective lens}}$$

$$= \frac{1200}{20} = 60 \text{ times}$$

12 **(a)** This tissue is found in the heart wall.

(d) The muscle fibers don't bind together and the heart can't beat in a rhythmic way as one functional unit.

13 No, because from the disadvantages of using dyes which is one of these methods is that they kill the living specimens, such as unicellular organisms (*Amoeba, Paramecium* and also yeast fungus).

14 **The statement is wrong** / As the nerve cell transmits the nerve impulses (messages) from the skin (receptor organ) to the spinal cord that is present in the vertebral column then to the effector organs, such as muscles.

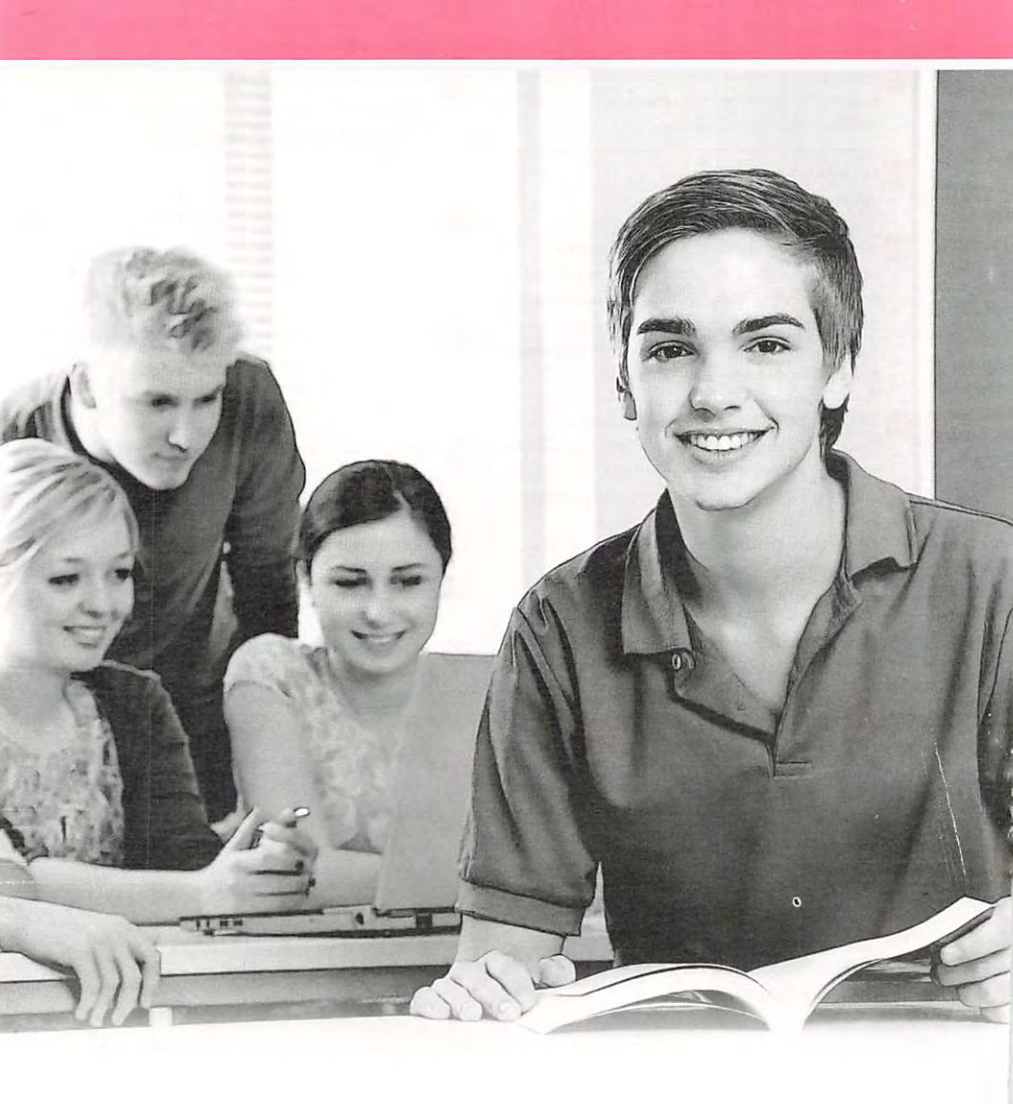
15 Because the tomatoes contain chromoplasts which are present extensively in fruits like tomato.

16 As excess amount of carbohydrates (glucose) is converted into glycogen that is stored in liver cells by the action of smooth endoplasmic reticulum.

17 **(a)** Both of them are non-membranous organelles that are found in the cytoplasm.

(b) Zero.

Answers of Test Yourself Questions



UNIT 1

Answers of Chapter 1
Preliminary Lesson

(1) ⓒ The nervous system.

(2) 1 ⓒ Carbohydrates and proteins.
2 ⓑ Nucleic acids.

Answers of Chapter 1 Lesson One

(1) 1 (1) ⓓ 1 : 1 : 2 (2) ⓒ (Z).
(3) ⓑ (Y). (4) ⓒ $C_{30}H_{52}O_{26}$
2 ⓓ Three molecules of cane sugar.
3 ⓒ (2X – 2).

(2) 1 ⓒ Glucose ⟶ Starch ⟶ Glucose ⟶ ATP
2 ⓓ Sucrose.
3 ⓐ Sucrose.

(3) 1 ⓒ Because energy is obtained rapidly from them.
2 ⓓ Cellulose only.

(4) 1 ⓓ Fructose and cellulose.
2 ⓓ Glucose.
3 ⓒ Dark blue / Orange

Answers of Chapter 1 Lesson Two

(1) 1 ⓑ type of fatty acids in each one of them.
2 ⓑ They are soluble in kerosene.

(2) 1 ⓑ a molecule of glycerol and a saturated fatty acid.
2 ⓒ Glucose – Sucrose – Glycogen – Fats.

(3) 1 ⓑ Fats / Glucose / Starch.
2 ⓑ (2) only.

Answers of Chapter 2 Lesson One

(1) ⓓ Amino acids / Fatty acids and glycerol / Glucose.

(2) 1 ⓓ Amino acids. 2 ⓒ 4
3 ⓓ (a) and (c) together. 4 ⓐ 1

(3) 1 ⓑ Starch.
2 ⓒ iron
3 ⓑ iodine

(4) 1 ⓑ hormones.
2 ⓑ proteins.
3 ⓒ Grapes – Milk – Peanut – Red meats.

(5) ⓐ Benedict's and Biuret's reagents.

Answers of Chapter 2 Lesson Two

(1) 1 ⓓ (2) and (3).
2 ⓒ 3
3 ⓓ (a) and (c) together.

(2) 1 ⓓ The presence of different sequences of nucleotides.
2 ⓐ Uracil.
3 ⓑ Thymine.
4 ⓒ $C_5H_{10}O_4$
5 ⓑ The two statements are correct and related.

Answers of Chapter 3

(1) ⓒ Polymerization / Oxidation.

(2) 1 ⓓ
2 ⓐ The enzyme action is slowed down on the shortage of water.
As the action of enzymes requires a water medium. So, if these conditions aren't available (as in case of the drying of vegetables and fruits and also in case of sugary foods like jam and molasses), this leads to the delay in the action of enzymes that are responsible for the hydrolysis of the organic compound. Therefore, they remain without hydrolysis for long time.

(3) 1 ⓒ The enzyme's activity increases at the period from (2) : (4).
2 ⓒ The enzyme's activity increases gradually, then decreases with the continuous rising of temperature.
3 ⓓ (1) / E

(4) 1 ⓑ NH_2



2 ⓒ The increase in the medium pH.

3 ⓒ The difference of pH value in the small intestine from stomach.

4 ⓒ

(5) 1 ⓐ (A) only.

2 ⓐ The person ingested antacids.

UNIT 2

Answers of Chapter 1

(1) ⓓ (X) and (Z).

(2) 1 ⓑ Virchow.

2 ⓒ The cell is the structural unit of the living organism.

(3) 1 ⓒ Unclear.

2 ⓒ 10 × 100

(4) 1 ⓑ Mirror / Slide / Objective lens / Ocular lens.

2 ⓑ To reduce the presence of air bubbles.

3 ⓑ The tissue is dyed by a suitable dye.

(5) 1 ⓒ Transmission electron microscope.

2 ⓐ light microscope after adding dyes.

Answers of Chapter 2 Lesson One

(1) ⓑ It is present in all living organisms cells.

(2) 1 ⓐ (1) only.

2 ⓐ Lipid derivative.

3 ⓓ Permeable to some substances.

(3) 1 ⓐ Endoplasmic reticulum.

2 ⓑ The presence of pores in both of them.

(4) 1 ⓐ Transferring RNA molecules into the cytoplasm to synthesize proteins.

2 ⓑ

Answers of Chapter 2 Lesson Two

(1) 1 ⓑ Cytoplasm microtubules.

2 ⓓ (a) and (c) together.

(2) 1 ⓒ A hepatic cell.

2 ⓐ Centrosome.

3 ⓐ amino acids.

4 ⓓ 54

(3) 1 ⓐ Endoplasmic reticulum.

2 ⓒ Smooth endoplasmic reticulum.

(4) 1 (1) ⓐ (X) and (Z).

(2) ⓓ (X), (Y), (Z) and (L).

(3) ⓐ Centriole.

2 ⓑ Lysis of pathogen by the digestive enzymes.

3 ⓓ Golgi body.

(5) 1 ⓑ ATP

2 ⓑ (Z) only.

3 ⓒ Sap vacuole.

(6) 1 ⓐ Mitochondria.

2 ⓑ (Y) represents the chloroplasts.

Answers of Chapter 3 Lesson One

(1) ⓑ Cell and tissue.

(2) 1 (1) ⓓ Transporting nutrients.

(2) ⓐ (1) and (2).

(3) ⓐ (3) only.

(4) ⓐ (1).

2 ⓒ Some of them have a complex structure and formed from different types of cells.

Answers of Chapter 3 Lesson Two

(1) 1 ⓑ Simple columnar.

2 ⓒ Surface layer of skin.

(2) 1 ⓑ Columnar epithelial tissue.

2 ⓒ Skin epidermis.

(3) 1 ⓑ Skeletal muscular tissue.

2 ⓑ Unstriated involuntary.

(4) ⓐ They act as the communication means among different cells.

(5) 1 Vascular connective tissue.

2 Nervous tissue.

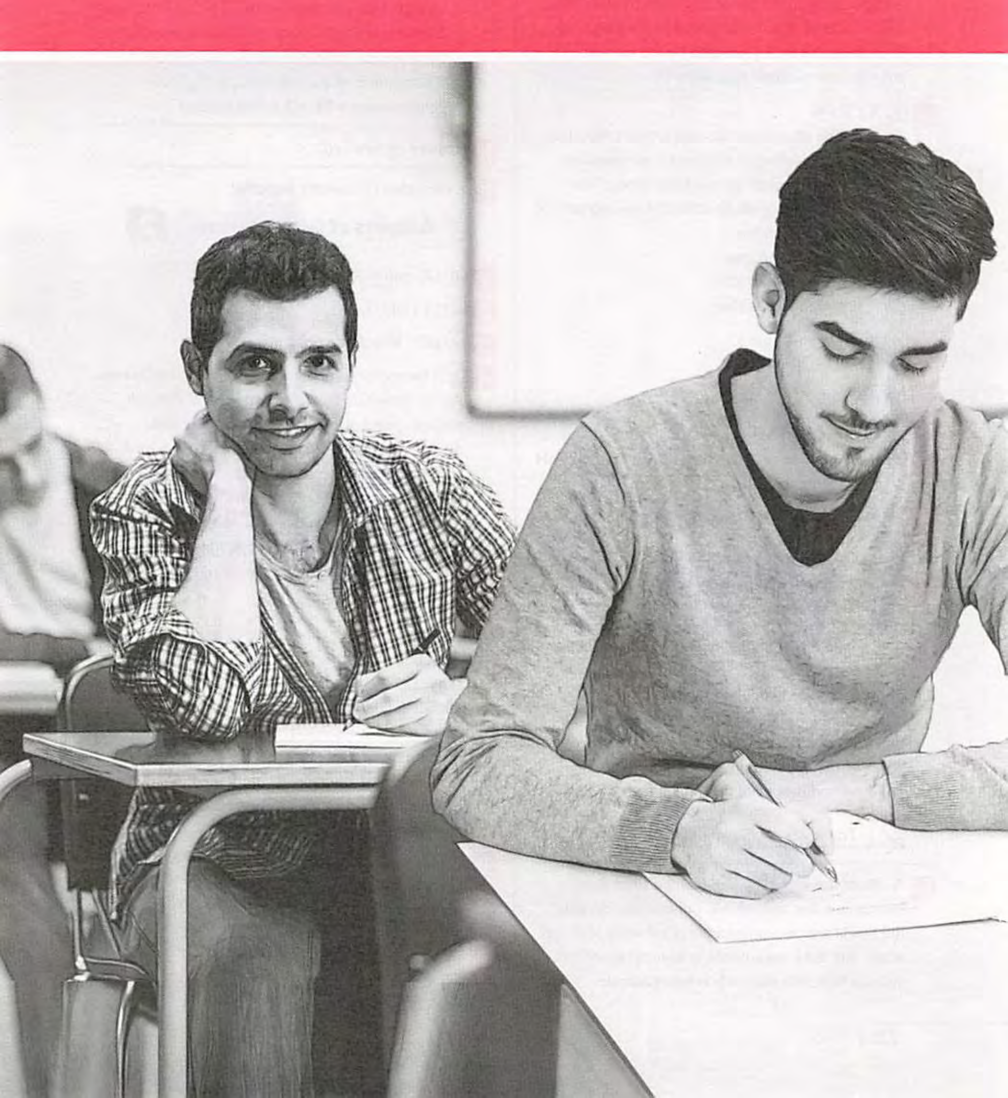
3 Collenchyma tissue.

4 Compound (Stratified) epithelial tissue.

5 Connective tissue proper.

6 Parenchyma tissue.

Answers of | 10 General Exams



Answers of General Exam 1

1 ⓓ Haemoglobin / Albumin.

2 ⓒ (1) and (4).
As the mitochondrion (1) performs the oxidation of glucose which is produced from carbohydrates digestion in this meal to produce the energy needed for the vital processes done by the cell. The excess of glucose is stored in muscles and liver in the form of glycogen by the help of smooth endoplasmic reticulum (4).

3 ⓒ X / Y / W
As from the characteristics of enzymes that they bind with the substrate to give an intermediate compound, then ends by the formation of the reaction products with no effect on the enzyme or consuming it, therefore :
(X) : represents enzyme.
(Y) : represents products.
(W) : represents substrate.

4 ⓒ Nuclear envelope.

5 ⓓ

6 ⓑ Lipids.

7 ⓐ Connective tissue.

8 ⓐ Each enzyme works efficiently at different pH value from the other.

9 ⓓ Striated voluntary muscles.

10 ⓒ

11 Foods are rich carbohydrates (especially starches) and also foods are rich in fats.

12 As the nucleus contains nucleoli that are found in abundance in the cells that form and secrete proteins, where inside the nucleus (RNA) is transcribed from the nucleic acid (DNA), then transferred to the cytoplasm through the tiny pores of the nuclear envelope to be used in building (synthesis) of proteins which the cell needs.
DNA $\xrightarrow{\text{Transcription}}$ RNA $\xrightarrow{\text{Translation}}$ Protein

13 As there are spots that are formed from fatty substances that are soluble in benzene, because the lipids are insoluble in polar solvents such as water, but they are soluble in non-polar solvents such as benzene and carbon tetrachloride.

14 (1) The level of lighting (light intensity) is not adjusted.
(2) Sample is not stained, where the dye makes the image more clear.

15 ∵ The centrosome consists of two centrioles and each centriole has 9 groups of microtubules arranged in triplets = $9 \times 3 = 27$ tubules
∴ One centrosome consists of $27 \times 2 = 54$ tubules
∵ Each animal cell contains a centrosome. So, three animal cells contain 3 centrosomes.
∴ The number of microtubules in the three centrosomes = **$54 \times 3 = 162$ tubules**

16 *Answer by yourself.*

17 Lysosomes (Secretory vesicles).

Answers of General Exam 2

1 ⓓ (Z) and (L).

2 ⓓ (Y) and (L).

3 ⓐ pH / Reaction speed

4 ⓑ The nucleus is necessary for the division process.
As we conclude from the experiment that the nucleus plays an important role in the cell division, because it contains chromatin which converts during the cell division into rod-like structures called "chromosomes". This doesn't mean that each of choices ⓐ and ⓒ represents the characteristics that are applied to the nucleus, but they aren't concluded from this experiment.

5 ⓒ The wall of intestine.
As the first and second muscles are involuntary muscles, so that they are smooth and cardiac muscles. Therefore the variable contraction within the day hours is an evidence that the first muscle is a smooth muscle, i.e. it is an involuntary muscle like the muscles of intestine's wall, where it activates through the digestion process while the cardiac muscles contract continuously within the day hours.

6 ⓒ Starch / Carbon, hydrogen and oxygen / Glucose

7 ⓓ Both are vascular tissues.

8 ⓒ Insulin.

9 ⓓ (D).

10 ⓒ Nucleus of a plant cell.

11 Because the mitochondria are from the membranous organelles, where they consist of two membranes (outer and inner) which contain phospholipids. Therefore, they are affected by lipid solvents.

12 Blood tissue "vascular connective tissue", as it is affected by iron to form haemoglobin in RBCs, and bone tissue "skeletal connective tissue", as calcium element enters in its structure.

(One example is enough)

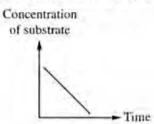
13 As there are tiny pores in it through which nucleic acid (RNA) after its transcription from DNA inside the nucleus passes to the cytoplasm to be used in the protein synthesis.

14 **(a)** Compound (A) : glucose.
(b) Example for compound (C) : cellulose or starch or glycogen.

(One example is enough)

15 As the magnifying power of the light microscope is the magnifying power of objective lens × the magnifying power of ocular lens = 100 × 20 = 2000x. So, the image is unclear, because the light microscope magnifies the objects up to 1500x of their real sizes.

16 **The graph is wrong** / As the concentration of the substrate decreases by passing time in case of the constancy of other conditions (factors) that affect the enzymatic reaction, such as the concentration of enzyme, temperature and pH. So, the relation is reversible as shown in the following graph :



17

	Ribosomes	Rough endoplasmic reticulum
Similarities :	• Both of them are located in the cytoplasm. • Both of them are responsible for the synthesis of proteins.	
Difference :	They are non-membranous organelles.	It is a membranous organelle.

Answers of General Exam 3

1 ⓓ It contains fatty acids.

2 ⓓ Chromatin.

3 ⓐ W
As the stomach enzyme works in an acidic medium whose pH ranges between (1.5 : 2.5), so that when decreasing the pH value from 4 to 2, the reaction speed increases which is represented by (W).

4 ⓐ

5 ⓑ $C_5H_{10}O_4$

6 ⓒ Schleiden.

7 ⓒ Compound tissue / Cell

8 ⓑ They are more common in plants than animals.

9 ⓒ Lining of the kidney tubules.

10 ⓒ Fusing the lysosome with the vesicle containing bacteria.

11 **The statement is wrong** / As monosaccharides consist of one molecule only that is made up of carbon atoms (3 : 6) attached with each of hydrogen and oxygen atoms by a certain bond, for example glucose is 6C sugar whose molecular formula is ($C_6H_{12}C_6$), while ribose whose molecular formula is ($C_5H_{10}O_5$), therefore the molecular weight is different in both.

12 Directly proportional relationship /As in the green plastids (chloroplasts), the photosynthesis process occurs to produce the glucose sugar (simple sugar) that the plant cell uses it in the production of energy in mitochondria and the excess is stored in the form of starch (complex sugar) in leucoplasts to be used by the cell for obtaining energy when needed.

13 As collenchyma and sclerenchyma (simple tissues) have the same function, where they act on supporting the plant and providing it with elasticity. Also, xylem tissue and phloem tissue (compound plant tissues) act as vascular tissues to transport nutrients and water in the plant.

14 Number of microtubules of centrosomes in 3 neurons = 0

15 In tube no. (1) the digestion occurs better / Due to the presence of starch (substrate) at the suitable pH (weak alkaline) and temperature (37°C) and

these conditions are suitable for the action of salivary amylase enzyme.

16 Smooth endoplasmic reticulum.

17 • Tissue no. (1) : is usually present connected with the skeleton, such as the muscles of arms, leg and trunk. *(One example is enough)*
• Tissue no. (2) : is present in the heart wall.

Answers of General Exam 4

1 ⓑ The substrate is consumed completely.
As the binding of enzyme molecules with all the molecules of substrate "sucrose", this leads to the consumption of all the substrate molecules, therefore it acts on the constancy of enzyme's activity at point (X).

2 ⓑ ✗ / ✗ / ✓ / ✓
As the plant cell organelles such as the endoplasmic reticulum and mitochondria are difficult to be seen by the used light microscope (400x), but they can be seen only by the electron microscope, while the cell wall and chromosomes can be seen by the light microscope.

3 ⓐ The nature of the enzyme changes and its action stops.

4 ⓓ cell wall.
As the cell wall of the plant cell consists mainly of cellulose fibers that act on protecting and supporting the cell. So, it prevents the entry of the microbe into the cell, while the cell membrane in the animal cell allows the microbe to enter into the cell, so that some types of WBCs engulf the microbe, then digests and damages it by the digestive enzymes that are found inside the lysosomes.

5 ⓑ Proteins only.

6 ⓓ Plasma membrane, DNA and ribosome.

7 ⓐ (Y) only / (X) & (Y)
As glucose passes through protein molecules (Y) and doesn't pass through the phospholipids molecules (X), due to their large size, while water passes through the hydrophilic heads of phospholipids molecules and also passes through the protein molecules.

8 ⓒ All the substances that consist of fatty acids.

9 ⓓ

10 ⓒ Ribosomes ⟶ Rough endoplasmic reticulum ⟶ Transporting vesicles ⟶ Golgi body.

11 Due to the absence of the fatty layer under its skin. So, it has no ability to live in the north pole, while the polar fox has the fatty layer under its skin that works as a thermal insulator to keep its body temperature in the polar (cold) regions.

12 **The statement is wrong** / As cytoplasm contains the cytoskeleton which is a network of filaments and microtubules that acquires the cell with a support to help it in maintaining its shape and form, and also works as a passage to transport the different substances from a place to another inside the cell wall, in addition to water, organic and inorganic compounds that it contains.

13 Both of them are conjugated proteins that are found in the human body, where chromatin consists of amino acids associated with nucleic acids, while the thyroxine consists of amino acids associated with iodine.

14 The magnifying power of the microscope is different according to the difference in wavelength of the used beam, we find that the image that is formed by the electron microscope, where it is characterized by being highly magnified compared with that is formed by the light microscope, because the wavelength of the light beam is shorter than that of the electron beam (i.e. the relationship is inversely).

15 **(a)** Lysosomes (Secretory vesicles).
(b) Lysosomes are formed by Golgi bodies and contain a group of digestive enzymes (lysosomal enzymes) that acts on the digestion of the large molecules of nutrients that are engulfed by the cell and change them into the simplest substances structurally which the cell can benefit from them.

16 No / Because the enzymes are highly specific than other chemical catalysts, as each enzyme is specific for :
- One reactant substance called substrate.
- One type or a few types of reactions.

17 **(a)** It is present in the heart wall.

(b) The muscle fibers don't bind together and the heart can't beat in a rhythmic way as one functional unit.

Answers of General Exam 5

1 ⓓ A cell in a plant leaf / Muscular cell

2 ⓑ Red blood cell.

3 ⓐ Both of them consist of two layers.

4 ⓐ The nature of the enzyme is changed and its activity stops.
As when the temperature increases above the optimum degree for the enzyme action, the enzyme activity decreases gradually until it stops, due to the change in its natural structure and does not return back to its activity again after lowering the temperature.

5 ⓐ Cell membrane.

6 ⓑ Orange / Blue / Violet

7 ⓓ Cell no. (4).
As the parenchyma tissue whose cell walls are made up of cellulose without containing any sediments, knowing that the thickness of the cell wall without any sediments = 100 nanometers. So, the cell that belongs to the parenchyma tissue is cell no. (4).

8 ⓒ Mitochondrion.

9 ⓒ Parenchyma cells / Vessels.
As parenchyma cells consist of protoplasm having a nucleus, which makes them alive, but this is absent from the vessels whose walls contain lignin deposited on their walls from the inside, so that these cells turn into non-living structures.

10 ⓓ (3) $\longrightarrow$ (1) $\longrightarrow$ (4) $\longrightarrow$ (2).
As the mucous material is secreted from the cells lining the trachea through the following stages : Protein is produced by the ribosomes associated with the rough endoplasmic reticulum to be transported through transporting vesicles to Golgi body, where it receives the protein and adds carbohydrates to it, forming the mucous material, which is then transported through the secretory vesicles which are separated from Golgi body and fuse with the plasma membrane.

11 As the carbohydrates help in storing fats, leads to gaining weight, when reducing the eating of meals rich in carbohydrates, the body begins to obtain the energy from the fats stored in it, this is occurred in case of absence or lack of carbohydrates, where the amount of energy obtained from lipids is more than that obtained from the same amount of carbohydrates.

12

Chromatid	Chromatin
• It is a filament that enters in the structure of chromosome, where chromosome consists of two filaments (chromatid) are joined together by centromere.	• It is minute tangled filaments that are coiled around each other.
• It is composed of the nucleic acid (DNA) coiled around protein molecules called histones.	• During cell division, it changes into rod-like structures called chromosomes.

13 • Nitrogen element according to the simple proteins.
• Nucleic acids, phosphorus, iodine and iron according to the conjugated proteins.

14 As chloroplasts are the place in which photosynthesis process occurs, where chlorophyll pigment transforms the light energy of the Sun into chemical energy that is stored in the chemical bonds of glucose sugar that is converted into starch to be stored in the plant cell for obtaining energy when needed.

15 The number of peptide bonds = Number of amino acids $-1 = 20 - 1 = 19$ peptide bonds

16 Both of them are organic molecules containing carbon, hydrogen and oxygen.

17 • Enzyme (A) is most active at pH = 3.2
• Enzyme (B) is most active at pH = 8

Answers of General Exam 6



1 ⓑ The number of carbon atoms that enter in the structure of sugar.

2 ⓑ The ability of seeing the cristae in the mitochondria.

3 ⓓ

4 ⓑ

As the gradual rise in temperature above the optimum temperature (30°C) for the enzyme's activity leads to a gradual decrease in the enzyme's activity until it stops, which is expressed in graph ⓒ, but the sudden rise in temperature much higher than the optimum temperature, this leads to a sudden decrease in the enzyme's activity, because of the rapid change in its natural composition, which is expressed by the graph ⓑ.

5 ⓐ Nucleus.

As the nucleus contains DNA which works on controlling and regulating the vital activities of the organism's cells. Therefore, if the nucleus is removed, all the vital processes in the cell will stop.

6 ⓐ Nucleoli and Golgi bodies.

7 ⓑ Glucose and protein.

8 ⓓ DNA and RNA / Starch / Mineral ions

9 ⓓ 0.4

As the constancy of the enzyme's activity indicates the consumption of all the substrate molecules, so we find that the maximum activity of this enzyme is at concentration (0.2), where all the molecules of the substrate have been consumed. So, when increasing the concentration of the substrate, the enzyme activity increases again, therefore its maximum activity is at concentration (0.4).

10 ⓑ Parenchyma cells / Xylem cells / Red blood cells

11 Because white blood cells contain the digestive enzymes that are present inside the lysosomes to digest and destroy the pathogens (influenza virus) which invade the human body. So, the body can get rid of this virus by increasing their number.

12 • The cell wall in plant cells separates the cell components from the surrounding.

• The cell membrane in animal cells separates the cell components from the surrounding.

13 Number of free carboxyl groups = 1

14 As the nucleus is surrounded by a double nuclear envelope that has several tiny pores through which the substances pass between the nucleus and cytoplasm, while the mitochondrion is surrounded by two membranes (one of them is internal and the other is external) through which a group of folds known as "cristae" that increase the surface area of the inner membrane where the chemical reactions that produce energy take place.

15 Ribosomes / Rough endoplasmic reticulum / Golgi body / Lysosomes (Secretory vesicles).

16 **The statement is wrong /** As the metabolic processes are a group of continuous biochemical reactions that take place inside the living organism cells and its stop leads to death.

17 The water loss during transpiration process will increase which causes wilting of the plant and its death.

Answers of General Exam 7



1 ⓓ starch to maltose.

As the feeling of a sweet taste when chewing a piece of bread is an evidence for the transformation of starch into simple sugar (maltose) by the action of the salivary amylase enzyme.

2 ⓒ 400x

3 ⓑ Increasing the production rate of substance (Z).

As when the enzyme inhibitor is added to (E_3), the production of each of (V, W & X) stops. So, all the molecules of substrate (U) will bind to enzyme (E_6), and the production rate of each of (Y &Z) increases.

4 ⓑ Lysosomes.

5 ⓐ Uracil.

6 ⓑ Compound light microscope.

7 ⓒ Protoplasm.

8 ⓓ Polymers – Organelles – Cells – Tissues.

9 ⓒ

10 ⓑ Protein molecules only.

11 • Compound (X) : Saturated fatty acids.
• Compound (Y) : Glycerol.

12 Cell membrane.

13 The iodine element enters in the structure of thyroxine hormone that is secreted from the thyroid gland.

14 • Xylem tissue.
• Sclerenchyma tissue.

15 *Answer by yourself.*

16 As during the photosynthesis process, glucose is produced then the cell used it during the cellular respiration to produce the energy (through glucose oxidation process) that is stored in the form of ATP compounds used by the cell for accomplishing all the vital processes.

17 • Phospholipids.
• Casein protein.

Answers of General Exam 8

1 ⓓ The conversion of the unsaturated fatty acids into saturated fatty acids.

2 ⓑ A cell of stomach.
As the number of nucleoli increases in the cells that specialized in the formation and secretion of protein substances such as enzymes.

3 ⓑ Consuming all molecules of the substrate.

4 ⓒ (2) & (5) / (1), (3), (4) & (6)

5 ⓓ Protein molecules.
As some protein molecules that are present in the plasma membrane of the cell act as gates for passing the mineral ions as calcium into the cell according to its need.

6 ⓒ DNA

7 ⓑ Supporting the plant and performing photosynthesis process.

8 ⓑ Monosaccharide sugar.
As when calculating the number of atoms that enters in its structure, we find that it consists of (6 carbon atoms, 12 hydrogen atoms and 6 oxygen atoms). So, it will be $C_6H_{12}O_6$ which represents the monosaccharide sugar.

9 ⓒ picking up the book from the desk.
As figure (A) represents a striated voluntary skeletal muscle fibers that are always connected to the human skeleton, as in the muscles of hands. So, when the nerve cell (B) stimulates cells (A) to contract, this process helps to pick up the book from the desk

10 ⓒ (Y).

11 As proteins are made up of amino acids which consist of amino group (NH_2) which nitrogen element enters in its structure, while nucleic acids (DNA & RNA) are made up of nucleotides which contain nitrogen element.

12 Both of them are from the simple epithelial tissue of the animal whose cells are arranged in one layer.

13 **(a)** During exercises, the glycogen that is stored in the muscles converts into glucose (i.e. catabolic process) to supply the muscles with energy.
(b) After eating a meal rich in carbohydrates, excess carbohydrates (glucose) converted into glycogen to be stored in the muscle and liver cells (i.e. anabolic process).

14 Because they work on increasing the inner surface area on which the chemical reactions that produce energy take place, in order to increase the production of energy needed by the birds muscles to be able to fly.

15 As the cytoplasm contains cytoskeleton which is a network of filaments and microtubules, where it provides the cell with a support to help it in maintaining its shape and form. So, the cytoplasm works on supporting the cell.

16 • (Y) : Galactose.
• (Z) : Lactose.

17

Tissue (X) "Parenchyma tissue"	Tissue (Y) "Sclerenchyma tissue"
• It is a living tissue. • It performs photosynthesis. • It stores nutrients, such as starch. • It is responsible for aeration.	• It is a non-living tissue whose cells are characterized by that their walls are thickened by lignin substance, in addition to cellulose. • It supports and strengthen the plant by providing it with the hardness and elasticity.

Answers of General Exam 9

1 ⓒ $C_{24}H_{42}O_{21}$
As when four glucose molecules are bonded together, three water molecules (i.e. six hydrogen atoms and three oxygen atoms) are removed, so that the molecular formula of the formed polymer is $C_{24}H_{42}O_{21}$

2 ⓒ (1) only.

3 ⓓ 37 / 7.5

4 ⓑ Chloroplast.

5 ⓑ Chromosomes.

6 ⓐ It enters in the structure of chromosome.

7 ⓑ
As there are more lysosomes in the white blood cells than the rest of the organelles, in order to get rid of the microbes that invade the body.

8 ⓐ Energy is consumed in it.

9 ⓑ Smooth endoplasmic reticulum.

10 ⓓ Both are related to the cell division.

11 The number of mitochondria increases in muscular cells to increase the production of energy needed by the muscles, as they are the storehouse for the substances that are necessary for storing energy from cellular respiration, as a result of nutrients oxidation (especially glucose), where this energy is stored in the form of ATP compounds and the cell can extract this energy from these ATP compounds once more. So, the mitochondria represent the centres of energy production in the cell (the energy storehouse in the cell).

12 This child will expose to a lot of risks, where the decrease in calcium leads to the weakness of bones, because the skeletal connective tissue (bones) whose intercellular substance is solid in which calcium deposits.

13 Both of them are simple sugars.

14 As Van leeuwenhoek microscope in which the used lenses have the ability to magnify the objects up to 200 times of their real sizes and used for examining different substances, such as water of ponds, blood and others, while the simple microscope of Robet Hooke used to examine a piece of cork and he found that it is composed of small boxes arranged in rows and he named each box by the word "cell".

15 *Answer by yourself.*

16 **Nothing occurs** / As enzyme (A) that stimulates the formation of the poisonous substance starts its work at temperature (40°C), where the optimum temperature of this enzyme is (75°C), while the human body temperature is (37°C). So, this enzyme can't work.

17 **The statement is wrong** / As endoplasmic reticulum forms an internal transport system that helps in transferring the substances from a part to another inside the cell and transfers substances between the nucleus and cytoplasm.

Answers of General Exam 10

1 ⓑ Waxes.
As the wax molecule is formed from the binding of monohydric alcohol with one fatty acid of high molecular weight.

2 ⓓ Mitochondria.

3 ⓒ
As the digestion process takes place faster in tube ⓒ, due to the presence of egg albumin (substrate) at a suitable pH (acidic medium) and a suitable temperature (37°C), and these circumstances are suitable for the action of pepsin enzyme.

4 ⓒ Rough endoplasmic reticulum.

5 ⓒ Van Leeuwenhoek.

6 ⓐ Amino acids and fatty acids.

7 ⓐ (1).

8 ⓓ (4).

9 ⓑ the stomach wall.

10 ⓑ
As when the cell contains the largest amount of ribosomes, this is an evidence of its production to a large amount of protein, and this requires the presence of a large content of RNA molecules that the cell uses to build proteins.

11 As dyes (stains) are used to stain or colour certain parts of the specimen to become more clear, but from the disadvantages of dyes is that they kill the living specimens as *Amoeba*, *Paramecium* and mould fungus.

12 As the green leaves contain green plastids which consist of chlorophyll pigment that converts the sunlight energy into chemical energy that is stored in the chemical bonds in glucose sugar.

13 As Golgi apparatus forms the lysosomes (secretory vesicles) that contain digestive enzymes to digest and destroy the pathogens (bacteria) that cause the lung inflammation (pneumonia). So, it plays a role in the elimination of the bacteria causing lung inflammation.

14 **The statement is wrong** / Because the nerve cell transmits the nerve impulses (messages) from the skin (receptor organ) to the spinal cord that is present inside the vertebral column, then to the effector organs, such as muscles.

15 Both of them are non-membranous organelles that are found in the cytoplasm.

16

Muscle in the hand finger	Muscle in the oesophageal wall
• Skeletal muscle. • It consists of striated voluntary muscle fibers.	• Smooth muscle. • It consists of unstriated involuntary muscle fibers.

17 **(a)** Because the two enzymes (X) and (Y) work efficiently at the temperature 37°C, where this temperature is the optimal temperature for the action of both enzymes (digestive enzymes).

(b) The enzyme's activity decreases until it stops, because each enzyme has an optimal pH value at which it works with a maximum efficiency.

2022

Model Exam 1

Choose the correct answer (1 : 10) :

1. The opposite graph illustrates molecules stored energy in two cells (A) and (B), which of the following expresses this graph accurately ? ....

Starch
Glucose
Glycogen
(A) (B)

(a) (A) represents a liver cell and (B) represents a plant cell.
(b) (A) represents a muscular cell and (B) represents a liver cell.
(c) (A) represents a muscular cell and (B) represents a plant cell.
(d) (A) represents a plant cell and (B) represents a muscular cell.

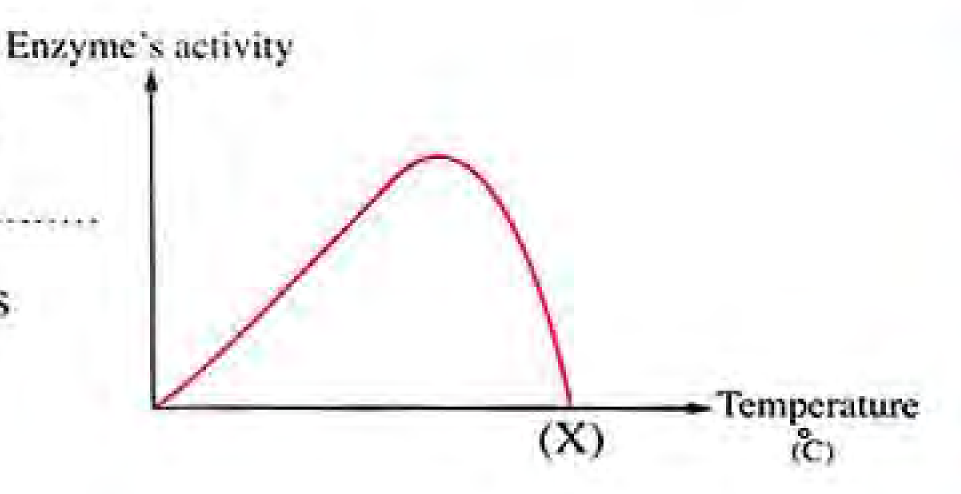
2. Which of the following can be seen by the light microscope ? ....

(a) Red blood cell.
(b) Virus.
(c) Nuclear envelope.
(d) Internal structure of the chloroplast.

3. Plasma membrane is similar to the nuclear membrane in that both of them ....

(a) consist of two layers.
(b) are characterized by the selective permeability.
(c) contain gates.
(d) separate between the cell contents and surrounding medium.

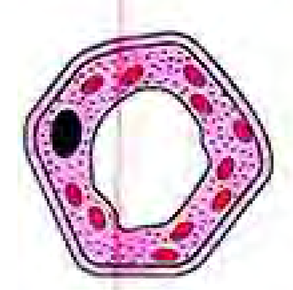
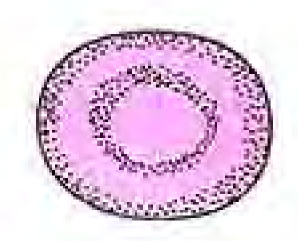
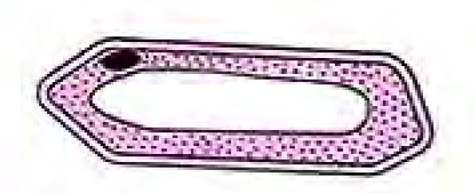
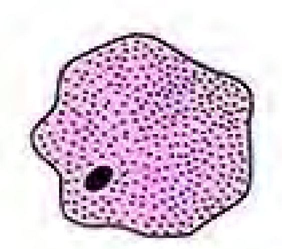
4. The opposite graph illustrates the effect of the temperature on the activity of an enzyme, what happened for this enzyme at point (X) ? ....



(a) The nature of the enzyme is changed and its activity stops.
(b) The enzyme is consumed.
(c) The activity of the enzyme increases.
(d) The activity of the enzyme is constant.



(5) All the following cells are similar in the presence of ....

(a) plasma membrane. (b) cell wall. (c) plastids. (d) nucleus.

(6) The components of four different types of food were tested and the results recorded in the following table, which type of food contains sugar, starch and protein respectively ? ....

	Benedict's test	Iodine test	Biuret's test
(a)	Blue	Orange	Violet
(b)	Orange	Blue	Violet
(c)	Orange	Orange	Blue
(d)	Blue	Blue	Blue

(7) **Study the following table, then determine :**

	Cell (1)	Cell (2)	Cell (3)	Cell (4)
Amount of cellulose in the cell wall :	100 nm	Zero	200 nm	100 nm
Amount of the other substances in the cell wall :	80 nm	Zero	Zero	Zero

Which cell belongs to the parenchyma tissue, knowing that the thickness of the cell wall without sediments equals = 100 nm ? ....

(a) Cell (1). (b) Cell (2). (c) Cell (3). (d) Cell (4).

(8) The organelle that is the most active during doing exercises is ....

(a) ribosome.
(b) endoplasmic reticulum.
(c) mitochondria.
(d) lysosome.

9 Xylem tissue is thickened by ....

(a) cellulose only.
(b) lignin only.
(c) suberin only.
(d) cellulose and lignin.

10 The cells that line the trachea secretes a mucous substance, and this process passed through a number of stages, as follows :

1. Adding carbohydrate to protein.
2. Fusing the secretory vesicles with the plasma membrane.
3. Secretion of the protein from ribosomes.
4. Separation of the vesicles from Golgi apparatus.

The correct arrangement for these stages is ....

(a) (1) → (4) → (2) → (3).
(b) (1) → (4) → (3) → (2).
(c) (4) → (1) → (2) → (3).
(d) (3) → (1) → (4) → (2).

Answer the following questions (11 : 17) :

11 **Explain :** obese patients are advised by reducing the eating of meals rich in carbohydrates.

12 **What is the difference between :** chromatid and chromatin ?

13 **What** are the elements that may be found in proteins and not found in carbohydrates ?

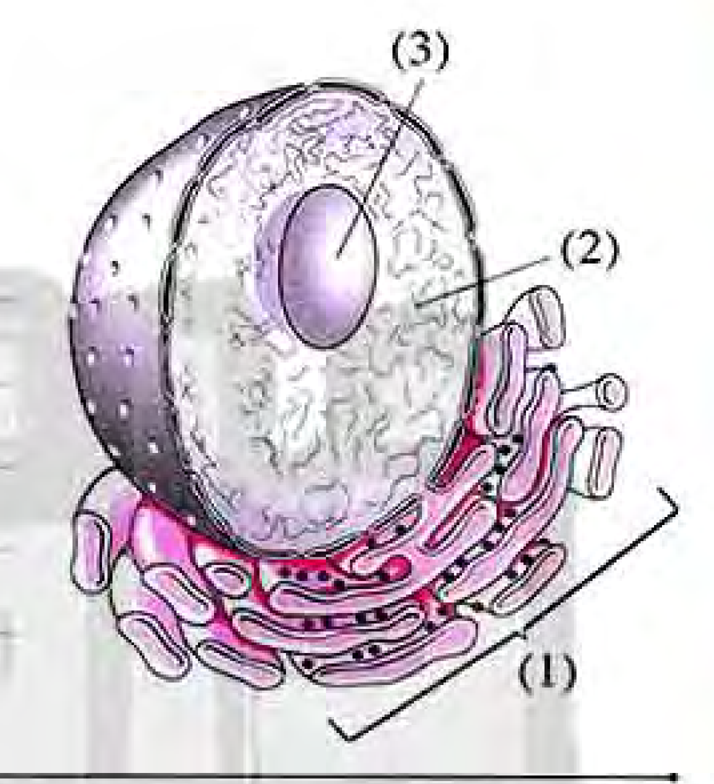


14 **What is the relation between :** the formation of starch and chloroplasts ?

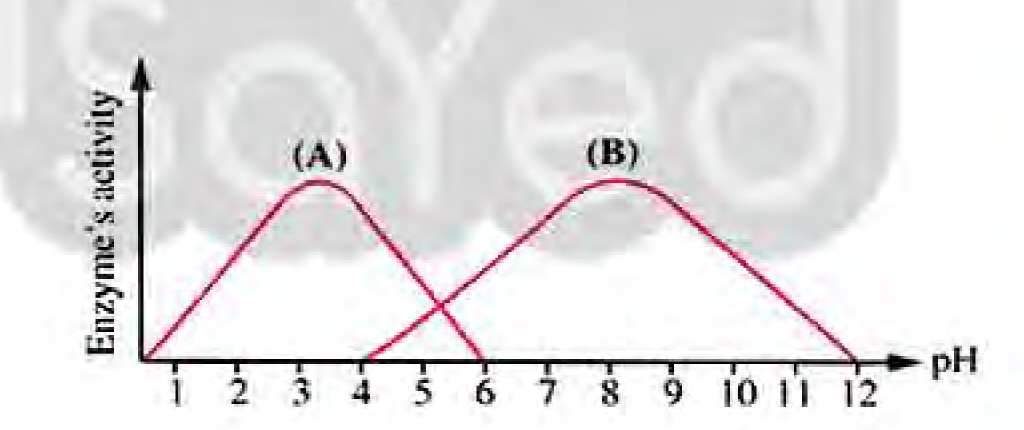
15 **Calculate :** the number of peptide bonds that are resulted from the binding of 20 amino acids.

16 **From the opposite figure :**

Write the name and the number of structure that is not found in the structure of the nucleus.



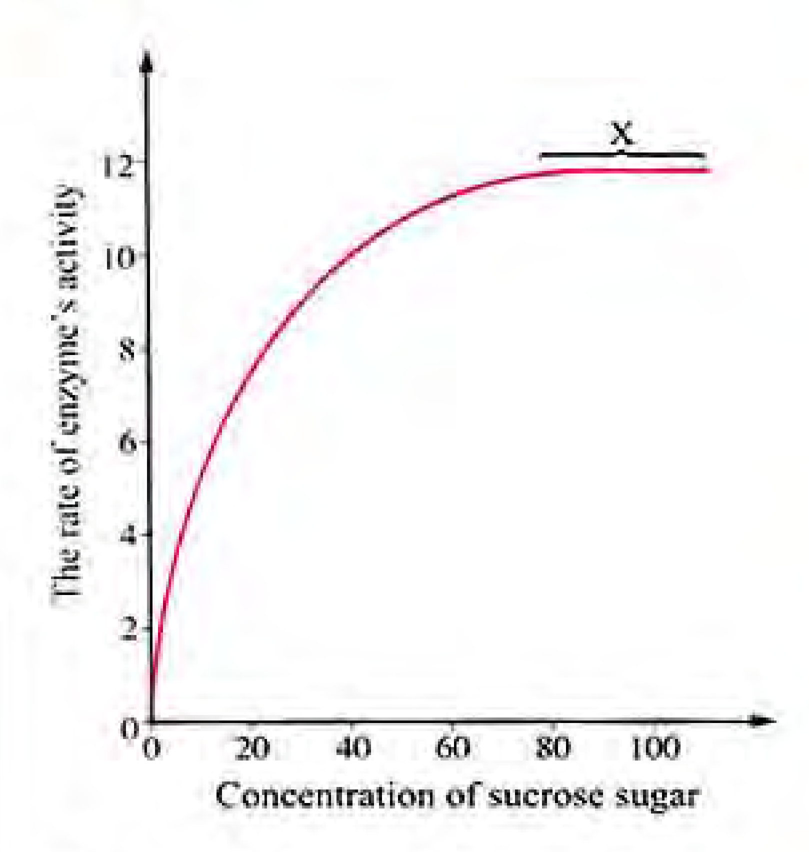
17 **The opposite graph illustrates the relation between two different enzymes (A) and (B) and pH value,** **conclude** the pH value at which the two enzymes (A) and (B) are most active.



Model Exam 2

Choose the correct answer (1 : 10) :

1. From the opposite graph that illustrates the relation between the rate of the activity of sucrase enzyme and the concentration of sucrose sugar. So, the activity of enzyme is constant at the part (X) because ....



(a) the enzyme's activity is inhibited.
(b) the substrate is consumed completely.
(c) the enzyme's concentration reduces the rate of the chemical reaction.
(d) the substrate's concentration reduces the rate of the chemical reaction.

2. Which of the following can be seen when staining a plant cell and examined it under the microscope with magnifying power (400x) ? ....

	Endoplasmic reticulum	Mitochondria	Chromosomes	Cell wall
(a)	✓	✗	✓	✓
(b)	✗	✗	✓	✓
(c)	✗	✓	✓	✗
(d)	✓	✓	✗	✗

3. A digestive enzyme in human digests its substrate rapidly at temperature (35°C), what happens if the enzyme and its substrate work at temperature (50°C) ? ....

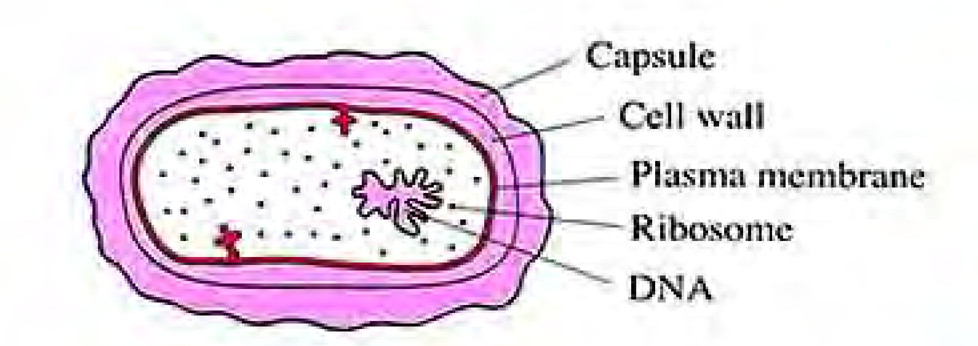
(a) The nature of the enzyme is changed and its work stops.
(b) The reaction continues with the same rate.
(c) The reaction occurs with a rapid rate.
(d) The reaction occurs with a slow rate.

4. In human blood, there are several types of white blood cells that can engulf, disintegrate and get rid of the microbes, while most of the plant cells can't do this, this is due to the presence of ....

(a) the cell membrane. (b) Golgi apparatus. (c) the chloroplasts. (d) the cell wall.



5 By using the opposite figure that illustrates a bacterial cell, which of the following components is found in each of the bacterial cell and animal cell ? ....

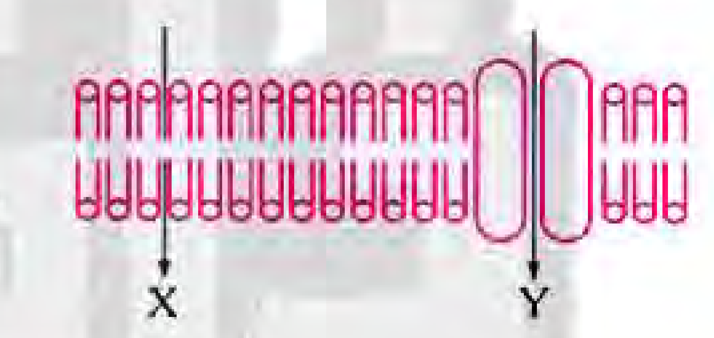


(a) Capsule, plasma membrane and cell wall.
(b) Capsule, DNA and ribosome.
(c) Plasma membrane, cell wall and DNA
(d) Plasma membrane, DNA and ribosome.

6 Which of the following organic molecules contains a free carboxyl group on its hydrolysis ? ....

(a) Phospholipids and polysaccharides.
(b) Phospholipids and proteins.
(c) Polysaccharides only.
(d) Proteins only.

7 The opposite diagrammatic figure illustrates a part of the plasma membrane. Which of the following shows the correct pathway for the transport of glucose and water through the plasma membrane respectively ? ....

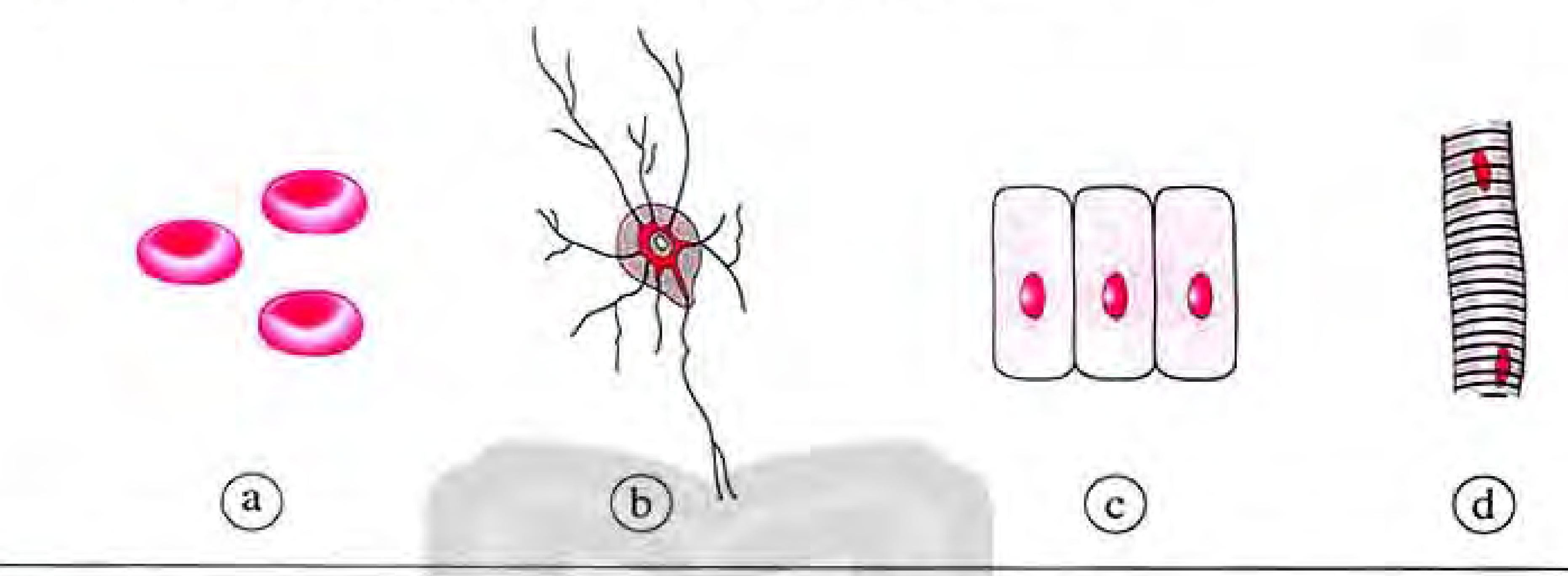


	Glucose	Water
(a)	Y	X & Y
(b)	X & Y	Y
(c)	X & Y	X
(d)	X	X & Y

8 All the following substances may give a negative result with Sudan-4 stain, except ....

(a) all the substances that consist of monosaccharides.
(b) all the organic substances.
(c) all the substances that consist of fatty acids.
(d) all the substances that consist of amino acids.

9 The following figures illustrate four types of cells of some tissues in the living organisms, which tissue has the ability to contract ? ....



10 Which of the following illustrates the correct pathway to produce a certain enzyme ? ....

(a) Ribosomes → Golgi body → Transporting vesicles → Endoplasmic reticulum.
(b) Ribosomes → Transporting vesicles → Golgi body → Endoplasmic reticulum.
(c) Ribosomes → Endoplasmic reticulum → Transporting vesicles → Golgi body.
(d) Ribosomes → Endoplasmic reticulum → Golgi body → Transporting vesicles.

Answer the following questions (11 : 17) :

11 Indian fox and polar fox are from the same genus (*Canidae*), but each one of them lives in its own environment. **In the light of your study**, **explain why** the indian fox has no ability to live in the north pole.

12 "Cytoplasm contains the cell organelles only".
How far this statement is correct ? With explanation.

13 **What is the similarity between :** chromatin and thyroxine ?

?

14 **What is the relation between :** the type of lens used in the microscope and the magnifying power ?

15 Inside the living cells, some substances are used and made benefit from them, **in the light of your study, answer :**

(a) **What** are the organelles that are responsible for the re-using process ?

(b) **How** are these organelles formed ?

16 Plants manufacture each of starch and cellulose. **Do** you expect that the enzymes which are participated in the formation of starch can be also used in the formation of cellulose ? **Explain your answer.**

17 **The opposite figure illustrates an important tissue in the human body, examine it, then answer the following :**

(a) **Where** is this tissue found ?

(b) **What happens if** the structure (A) is absent from this tissue ?

(A)

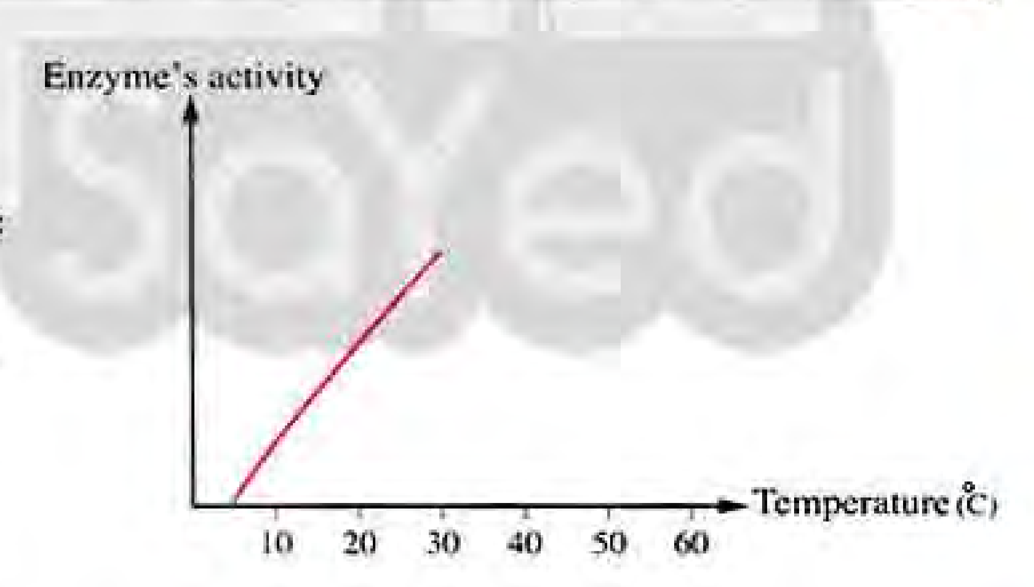
Model Exam 3

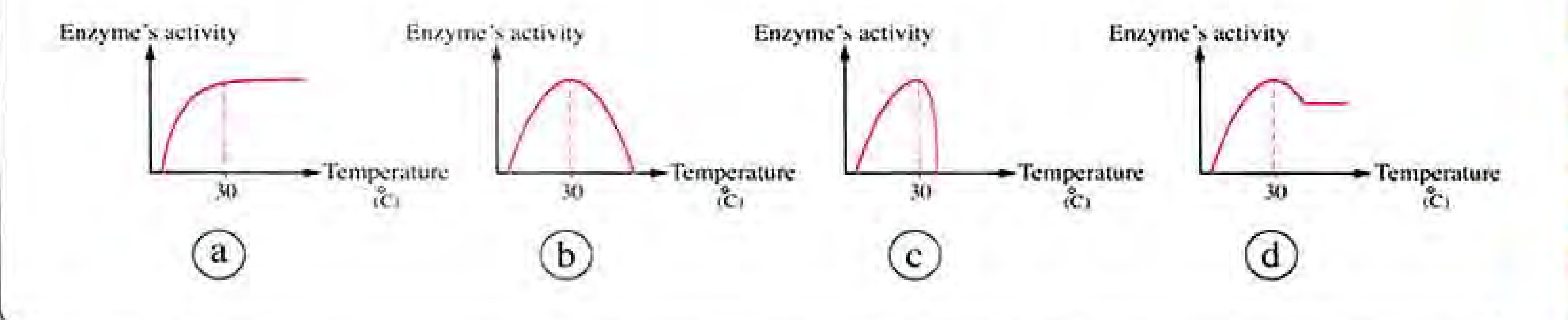
Choose the correct answer (1 : 10) :

1. If you know that the general formula of carbohydrates is $(CH_2O)_n$, and the chemical formula of glucose is $C_6H_{12}O_6$. So, (n) refers to ....
   - (a) the number of the water molecules that are found in sugar.
   - (b) the number of the atoms of internal elements that enter in the structure of sugar.
   - (b) the number of the chemical bonds among the atoms of elements.
   - (d) the number of (OH) groups between the carbon atoms.

2. The electron microscope is characterized by forming more accurate images than that of the light microscope, which of the following is considered the application for this characteristic ? ....
   - (a) Obtaining a bigger image for the cell.
   - (b) The ability to see the cristae of the mitochondria.
   - (b) The ability to see the cell wall of a plant cell.
   - (d) The ability to see the nucleus in *Amoeba* cell.

3. In an experiment to study the effect of temperature on the activity of an enzyme in the body, a student added this enzyme on the substrate, providing the suitable conditions for its action, then he recorded the results as shown in the opposite graph, which graph may be obtained if the student raises the temperature up to 60°C suddenly ? ....







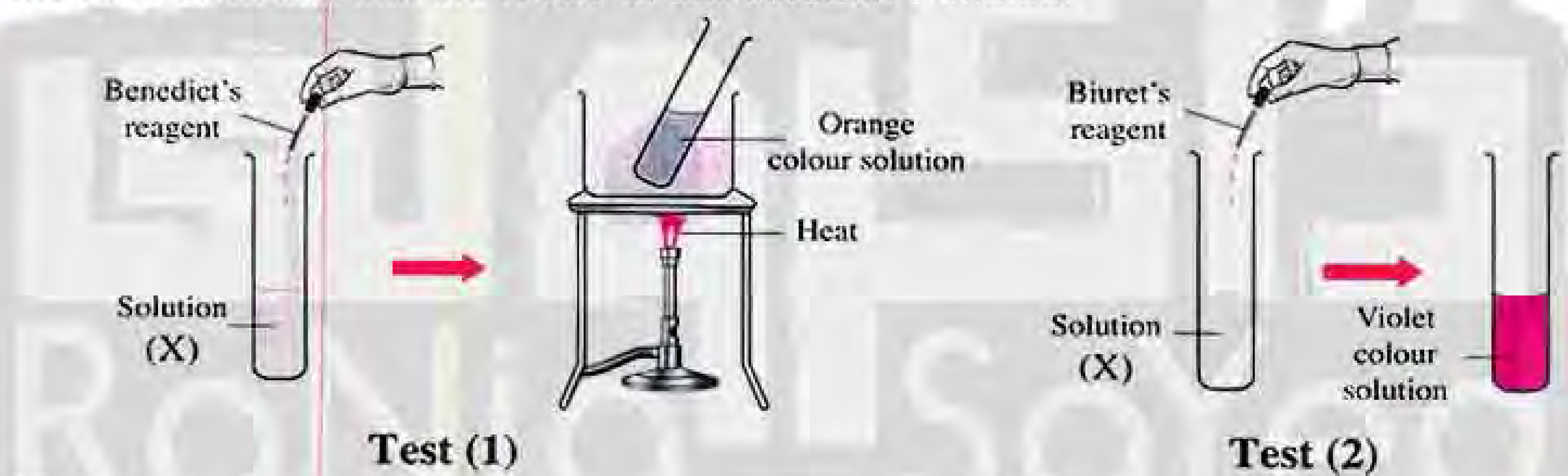
4. A researcher removed a component of the animal cell during the carrying out of one of his experiments, this leads to stopping all the vital processes in the cell after several hours. What do you expect this organelle to be ? ....

(a) Nucleus.
(b) Endoplasmic reticulum.
(c) Lysosome.
(d) Golgi apparatus.

5. The ability of the thyroid gland to build protein means that its cells contain .... in abundance.

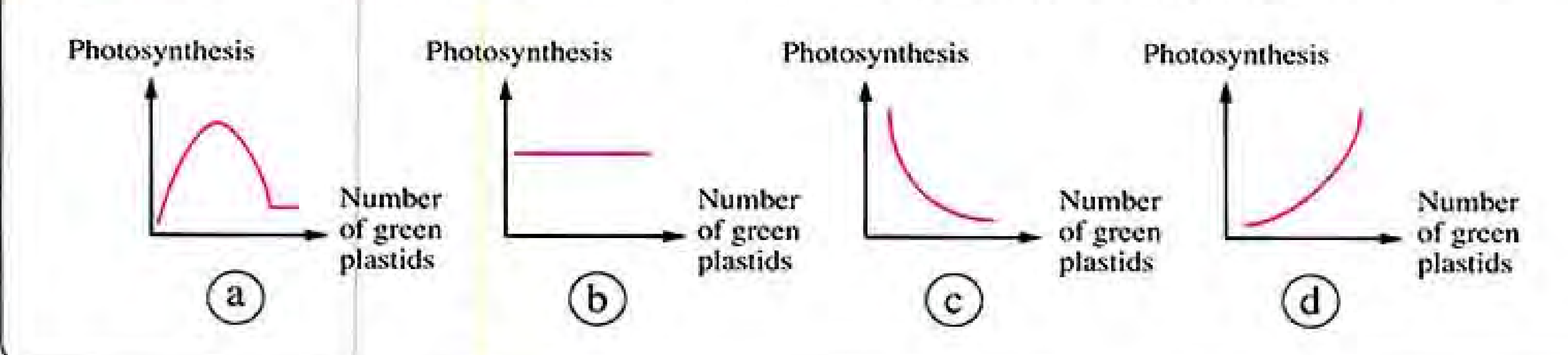
(a) amino acids and rough endoplasmic reticulum
(b) fatty acids and rough endoplasmic reticulum
(c) nucleotides and ribosomes
(d) amino acids and smooth endoplasmic reticulum

6. The two following figures represent two tests carried out on the solution (X), what are the food elements that are found in this solution ? ....



(a) Protein and starch.
(b) Glucose and protein.
(c) Starch and fats.
(d) Starch and glucose.

7. Which of the following graphs expresses the relation between the number of green plastids and the efficiency of the plant to do the photosynthesis process ? ....

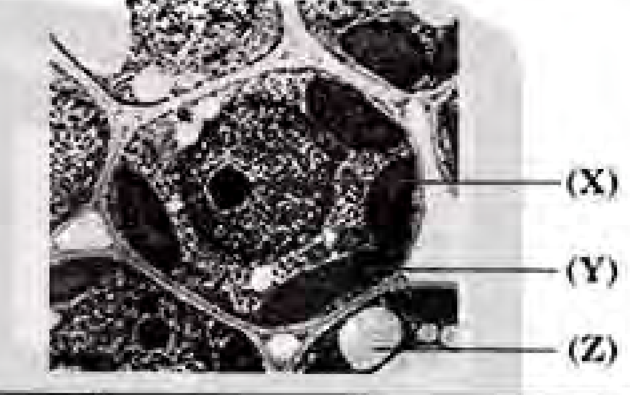


8 The opposite graph illustrates the relation between the activity of a certain enzyme and its concentration in the medium, when the concentration of the substrate increases, it is expected that the highest activity of this enzyme is at the concentration ....

Enzyme's activity
Enzyme's concentration
0 0.1 0.2 0.3 0.4

(a) 0.1 (b) 0.2 (c) 0.3 (d) 0.4

9 What do the organelles (X), (Y) and (Z) contain ? ....



	(X)	(Y)	(Z)
(a)	Air	Chlorophyll	Protein
(b)	Mineral ions	Starch	DNA and RNA
(c)	Water	Mineral ions	Starch
(d)	DNA and RNA	Starch	Mineral ions

10 Which of the following choices links the cells with their function in a correct form ? ....

	Storage	Transport and support	Transport of O_2
(a)	Red blood cells	Xylem cells	Parenchyma cells
(b)	Parenchyma cells	Xylem cells	Red blood cells
(c)	Xylem cells	Sclerenchyma cells	Parenchyma cells
(d)	Parenchyma cells	Sclerenchyma cells	Red blood cells

Answer the following questions (11 : 17) :

11 **Give reason for :** the number of white blood cells increases when the human infects with influenza virus.

?

12 **What** are the structures that separate between the living cell contents and their surrounding environment ?

13 **What** is the number of carboxyl groups that are resulted from the binding of 15 amino acids in a polypeptide chain ?

14 Each of the nucleus and mitochondria is surrounded by a double membrane, but each one has its nature that helps in performing the vital functions of the cell. **Explain this.**

15 **Follow by arrows only** the route of insulin protein since its production, till its arriving to the target cell.

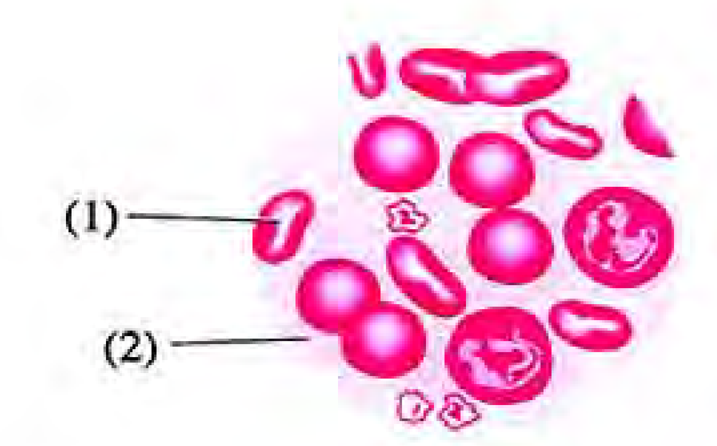
16 "The metabolic processes occur in the cells of the digestive system only".
How far this statement is correct ? With explanation.

17 **What happens if :** the waxy layer that covers the leaves of cactus plant is absent ?

Model Exam 4

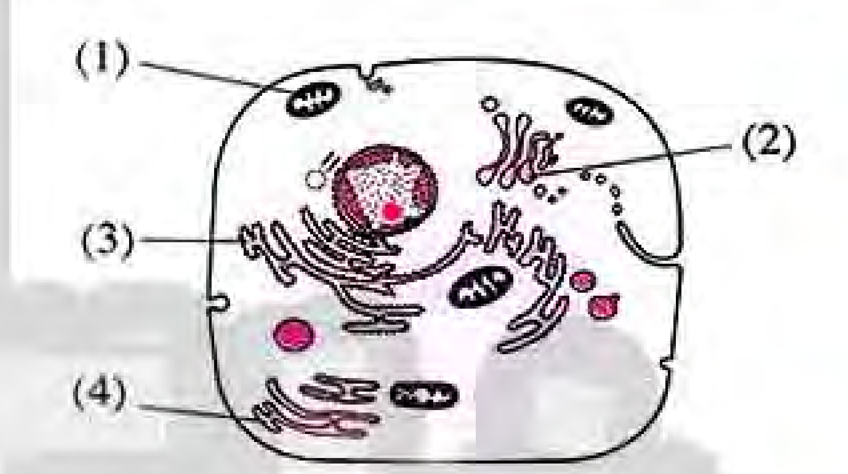
Choose the correct answer (1 : 10) :

1 The opposite figure illustrates an important tissue in the human body, the structures (1) and (2) contain .... respectively.



(a) albumin and haemoglobin
(b) albumin and thyroxine
(c) chromatin and thyroxine
(d) haemoglobin and albumin

2 The opposite figure illustrates an animal cell, which of the following its activity increases inside the cell after digesting a meal rich in carbohydrates ? ....



(a) (1).
(b) (2).
(c) (1) and (4).
(d) (2) and (3).

3 The following figure illustrates the enzyme action :



What does each of (W), (X) and (Y) represent in this chemical reaction ? ....

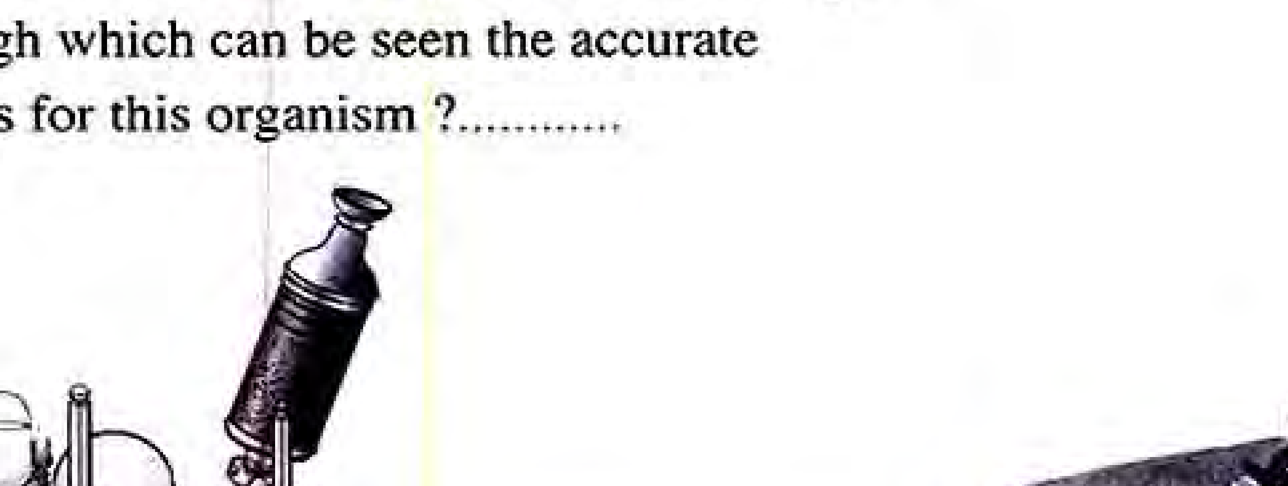
	Enzyme	Product	Substrate
(a)	W	X	Y
(b)	X	W	Y
(c)	X	Y	W
(d)	Y	W	X

4 The membrane that prevents the transfer of DNA into cytoplasm in the plant cell is the ....

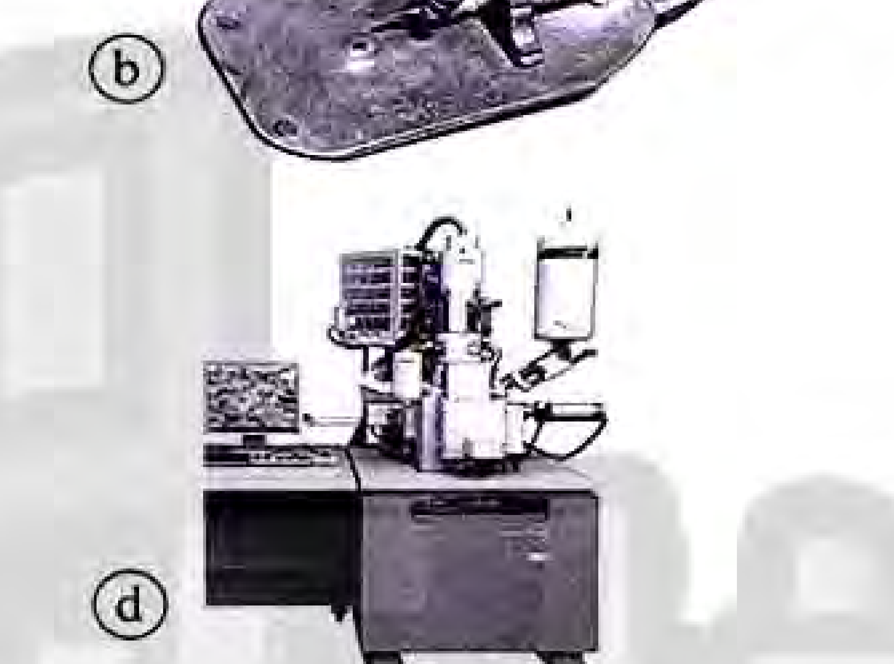
(a) plasma membrane.
(b) cell wall.
(c) nuclear envelope.
(d) sap vacuole membrane.



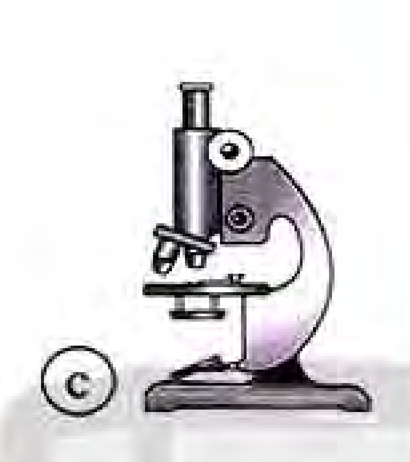
5 The opposite figure represents a primitive organism "*Euglena*", what is the microscope through which can be seen the accurate details for this organism ?............



(a)



(b)



(c)

(d)

6 Which of the following molecules varies in its chemical composition greatly ? ....

(a) Simple sugars.
(b) Lipids.
(c) Nucleic acids.
(d) Carbohydrates.

7 The food moves from the esophagus to the stomach by the action of ....

(a) enzymes.
(b) water.
(c) hormones.
(d) mucus.

8 From the opposite graph that illustrates the relation between the activity of 3 enzymes (X), (Y) and (Z) and the pH value, we conclude that ....

(a) each enzyme works efficiently at pH value that differs from the other.
(b) each enzymes works efficiently in a small thermal range.
(c) three enzymes work efficiently in an acidic medium.
(d) three enzymes work efficiently in an alkaline medium.

9 Chimpanzee can climb the high trees, due to the contraction of .... muscles.
(a) unstriated voluntary
(b) unstriated involuntary
(c) striated involuntary
(d) striated voluntary

10 Which of the following figures represents a cell in human liver ? ....


(a)


(b)


(c)

(d)

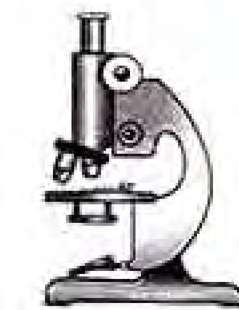
Answer the following questions (11 : 17) :

11 A person wanted to get rid of the excess weight by following a certain diet. **What** types of food do you recommend to reduce from eating them ?

12 **What is the relation between :** the number of nucleoli in the cell and the formation of protein ?

13 **Explain :** car maintenance worker resorts to use benzene for cleaning up his clothes.

14 On examining a tissue by using the microscope as shown in figure, it is found that the image is unclear. **Suggest two reasons for this.**



15 **Calculate :** the number of microtubules that form the centrosome in three liver cells.

?

16 **Study the following diagram, then illustrate how far it is correct, with explanation :**

Stops and returns on increasing the temperature ← decrease the temperature under zero — **Enzyme** — increase the temperature over (55°C) → Stops and returns on decreasing the temperature

17 **The opposite figure represents a section in the skin, study it, then answer :**

Epidermis (1)
Dermis (2)

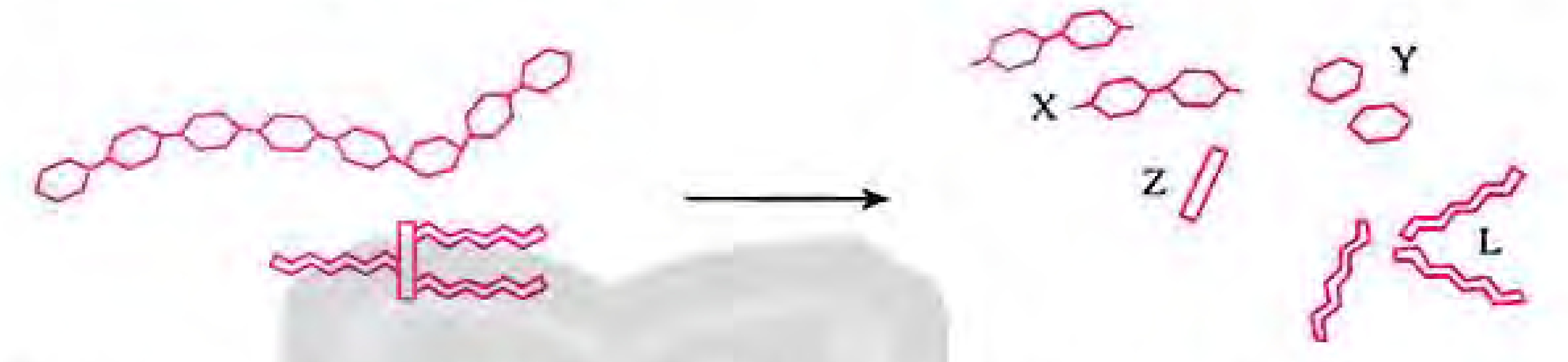
(a) Tissue no. (1) differs from tissue no. (2).
Explain this.

(b) What is the importance of tissue no. (1) ?

Model Exam 5

Choose the correct answer (1 : 10) :

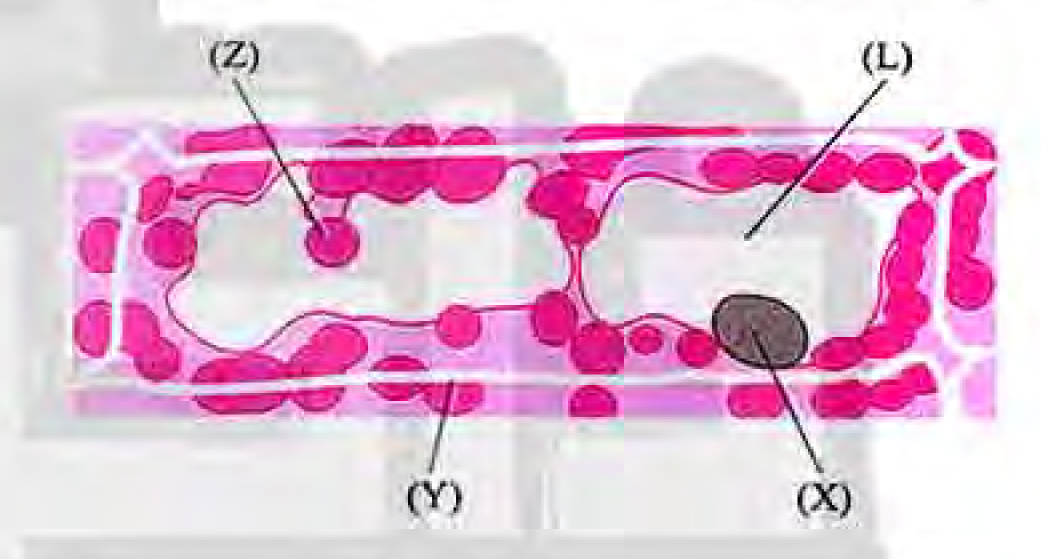
1. The following figure illustrates the molecules of two different food substances before and after the digestion by enzymes :



Which of the following represents the products of the digestion of fat substance ? ....

(a) (X) and (Y). (b) (Y) and (Z). (c) (X) and (L). (d) (Z) and (L).

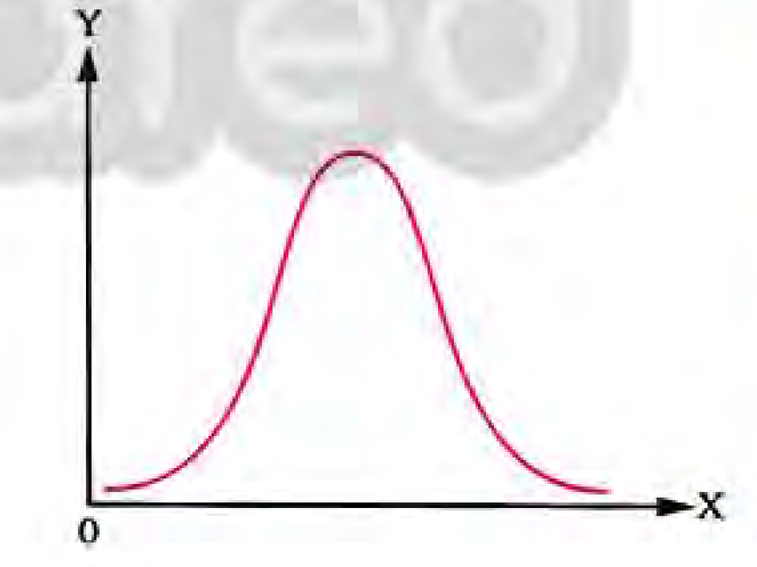
2. The opposite figure illustrates a cell of a living organism that lives in pond and fresh swamp water. Which of the following refers to that is a plant cell ? ....



(a) (X) and (Y). (b) (Y) and (Z).

(c) (X) and (L). (d) (Y) and (L).

3. An experiment was carried out to know the effect of the pH value on the enzyme action, the results recorded on the opposite graph, determine from the following table what X and Y-axis represent ....



	X-axis	Y-axis
(a)	pH	Reaction speed
(b)	pH	Time
(c)	Reaction speed	pH
(d)	Time	pH



4 An animal cell whose nucleus was removed, however it was not damaged, then it was placed in a solution stimulating the cell division. So, it remained alive for a day, but it didn't divide and when comparing it with a healthy cell, it was found that it divided twice within this period, what do you conclude from this experiment about the role of the nucleus in the cell ? ....

(a) The nucleus controls the normal activity of the cell.

(b) The nucleus is necessary for the division process.

(c) The nucleus is necessary for the life.

(d) The nucleus is the only part in the cell that contains RNA

5 The following table illustrates the action of two different body muscles within a day, study it, then answer :

	First muscle	Second muscle
The number of muscle contraction times	Variable within the day hours.	Continue within the day hours.

The first muscle may be found in the ....

(a) heart. (b) leg. (c) wall of intestine. (d) mesentery.

6 Which of the following represents the elements and basic units that are used in the building of the biological macro-molecules ? ....

	Macro-molecules	Elements	Basic units
(a)	Lipids	Carbon, hydrogen, oxygen and nitrogen	Amino acid
(b)	Protein	Carbon, hydrogen, oxygen and nitrogen	Fatty acid
(c)	Starch	Carbon, hydrogen and oxygen	Glucose
(d)	Phospholipids	Carbon, hydrogen and oxygen	Fatty acid

7 The structure (X) is similar to the structure (Y) in that both of them ....

(a) transfer food substances that are formed in leaves.

(b) transfer water and salts in one direction only.

(c) are thickened by lignin.

(d) are a vascular tissue.

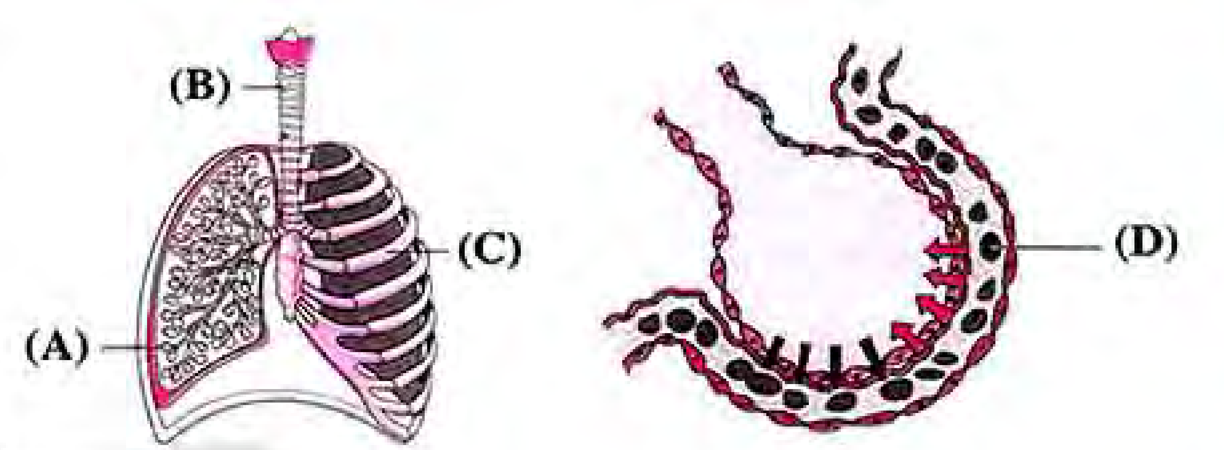

(X)


(Y)

8 Which of the following is not considered a source of energy in the cell ? ....

(a) Glucose. (b) Lactose. (c) Insulin. (d) Starch.

9 The two opposite figures illustrate the respiratory system in human and an alveolus surrounding by blood capillaries, which label represents a cell ? ....



(a) (A). (b) (B).

(c) (C). (d) (D).

10 Which of the following structures contains genes ? ....

(a) Plasma membrane of a certain plant cell.

(b) Cytoplasm of an animal cell.

(c) Nucleus of a plant cell.

(d) Lysosome in an animal cell.

Answer the following questions (11 : 17) :

11 **Give reason for :** the mitochondria are affected by lipid solvents.

12 **Give an example for :** an animal tissue whose formation is affected by a food mineral element **(in the light of your study)**.

13 Nuclear envelope plays an important role in protein synthesis. **Explain this.**

?

14 **You have 3 carbohydrate compounds (A, B and C), if two compounds (A and B) are from the same group of substances, where compound (A) is a part of compound (B), and compound (C) is produced from the combination of several molecules from compound (A) :**

(a) **Mention** the name of the compound (A).

(b) **Give an example for** the compound (C).

15 **What happens if :** the magnifying power of the objective lens in the light microscope is (100x) and the magnifying power of the ocular lens is (20x) ?

16 The opposite graph illustrates an enzymatic reaction. **How far** this graph is correct ?
With explanation.

Concentration of reactant

Time

17 **Write a similarity and a difference between :**
The organelles that are shown in the figure.

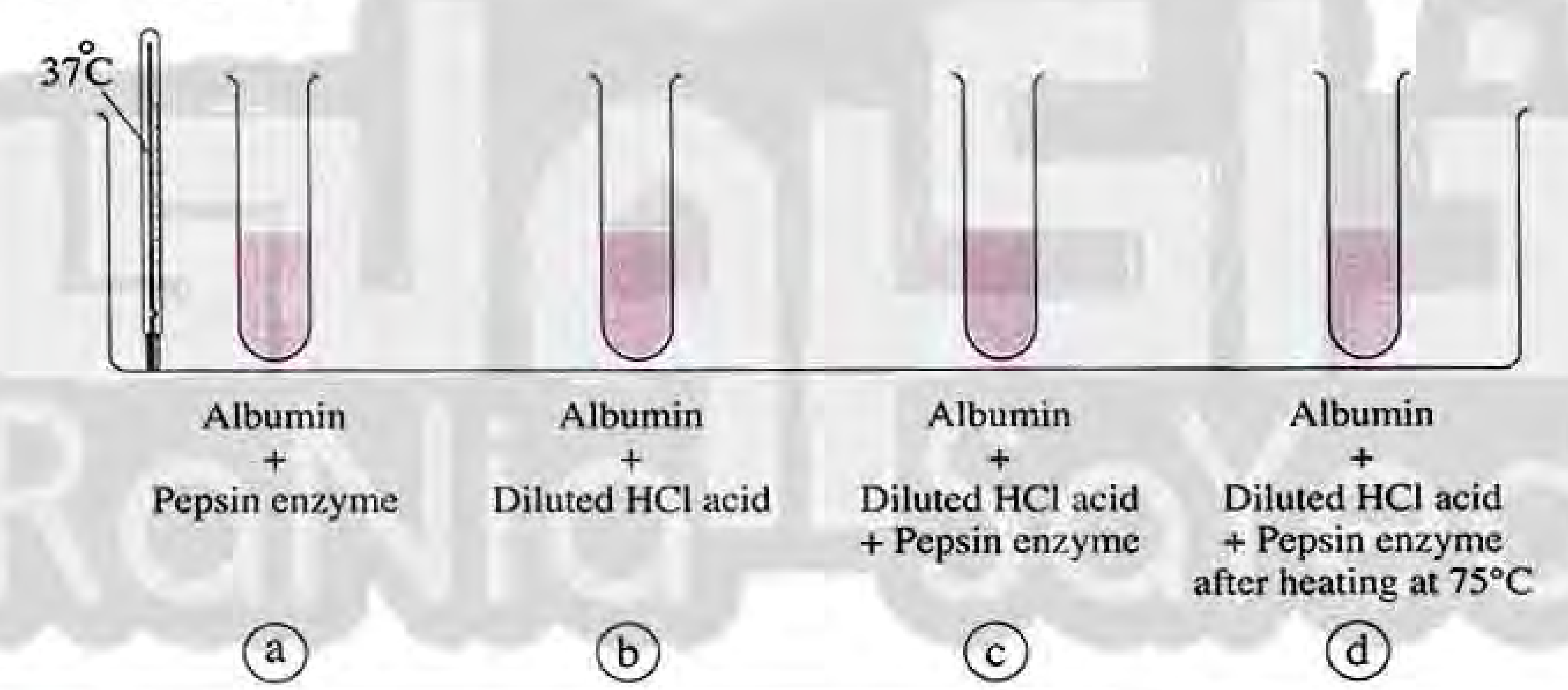
Model Exam 6

Choose the correct answer (1 : 10) :

1. The organic molecules that consist of one fatty acid are ....
   (a) fats. (b) waxes. (c) phospholipids. (d) oils.

2. All the following can be seen under the light microscope when examining a stained cell for an onion plant with magnifying power (400x), except the ....
   (a) cell wall. (b) nucleus. (c) cytoplasm. (d) mitochondria.

3. The following figure illustrates an experiment of the digestion of albumin by pepsin enzyme that is extracted from the human stomach, in which test tube will protein be digested rapidly ? ....



4. Phagocytes are a type of white blood cells that engulf and digest the bacteria and debris cells, which of the following plays a role in the digestion of these substances ? ....
   (a) Mitochondria.
   (b) Lysosome.
   (c) Centrosome.
   (d) Rough endoplasmic reticulum.



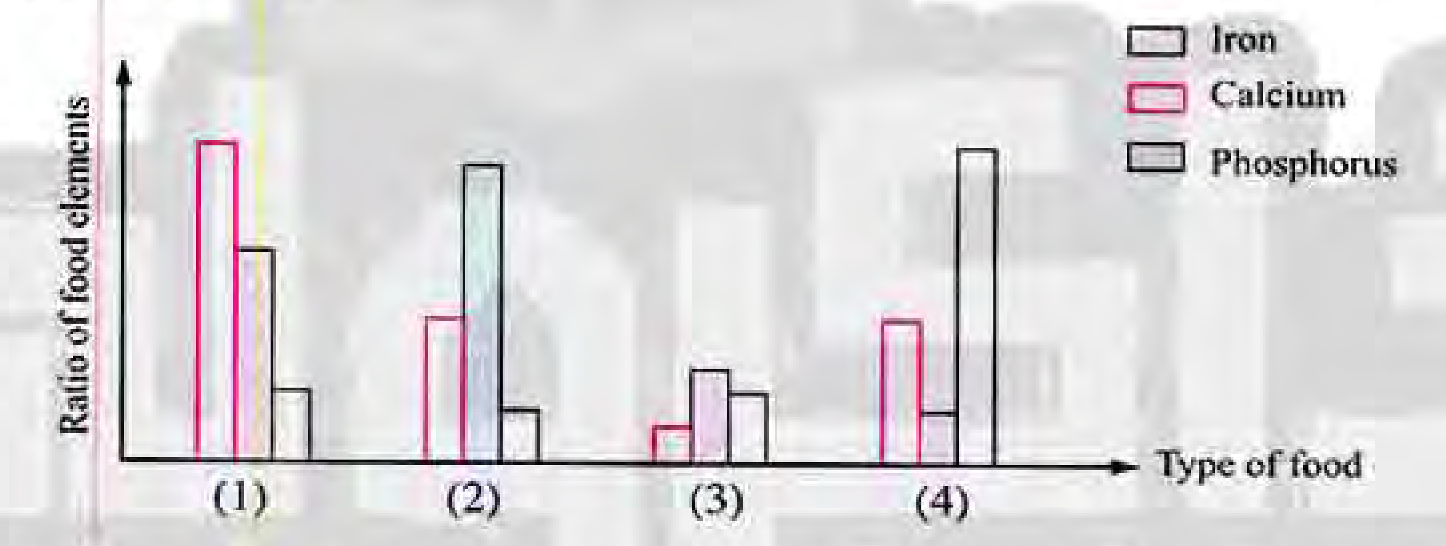
5 The scientist who could see the green scum by using a microscope with magnifying power may reach about 180 times of its real size is ....

(a) Virchow.
(b) Robert Hooke.
(c) Van Leeuwenhoek.
(d) Schwann.

6 Which of the following organic molecules contains the bonds (C = O) ? ....

(a) Amino acids and fatty acids.
(b) Amino acids and carbohydrates.
(c) Fatty acids and carbohydrates.
(d) Amino acids, fatty acids and carbohydrates.

The following figure illustrates the ratio of food elements in some types of different food, study it, then answer :



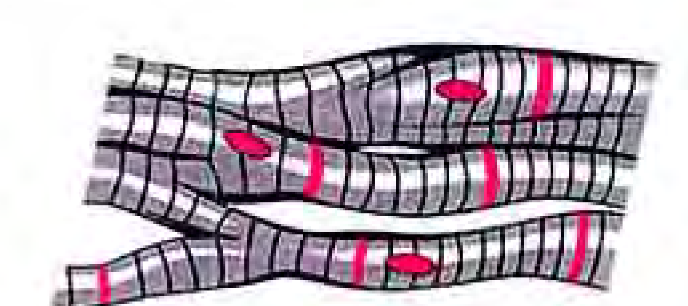
7 Which type of food participates in the treatment of osteomalacia in children ? ....

(a) (1).
(b) (2).
(c) (3).
(d) (4).

8 Which type of food is recommended by the doctors for the patients with anemia ? ....

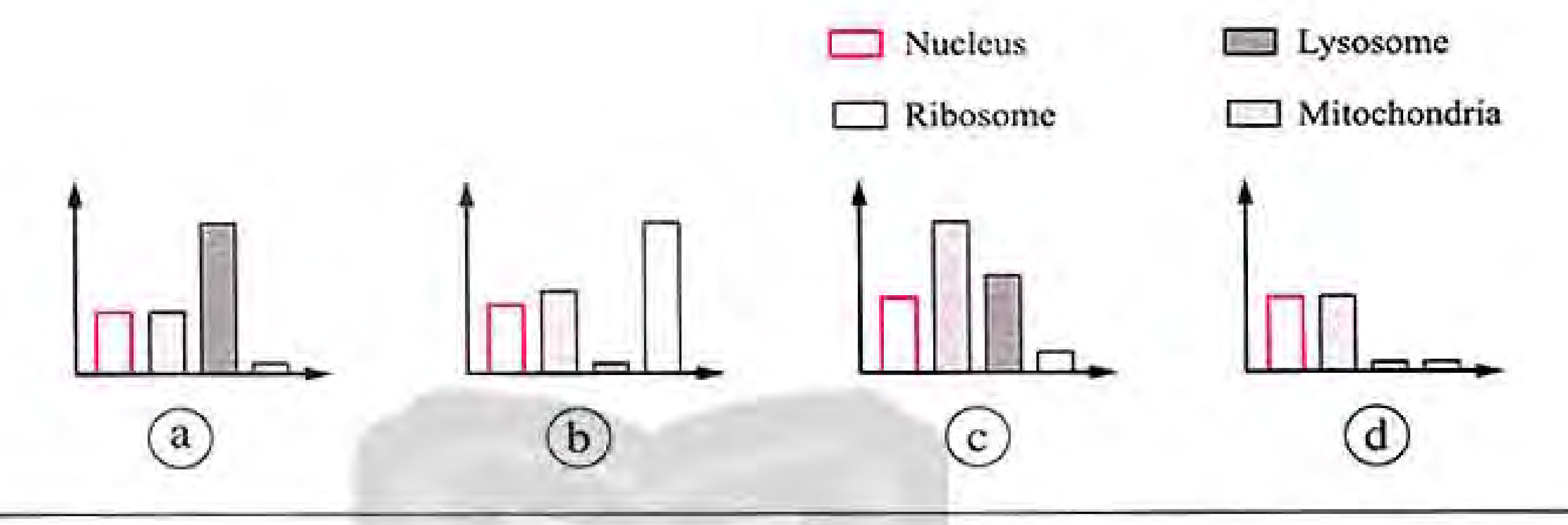
(a) (1).
(b) (2).
(c) (3).
(d) (4).

9 The opposite figure represents a muscle in ....



(a) the wall of the digestive canal.
(b) the wall of the heart.
(c) the human leg.
(d) the diaphragm of the respiratory system.

10 The following graphs illustrate the components of 4 different animal cells, which cell contains a large amount of RNA ? ....



Answer the following questions (11 : 17) :

11 Using the dyes on examining the living specimens is considered double-edged sword, **explain this.**

12 **What happens if :** the internal leaves of cabbage is exposed to light ?

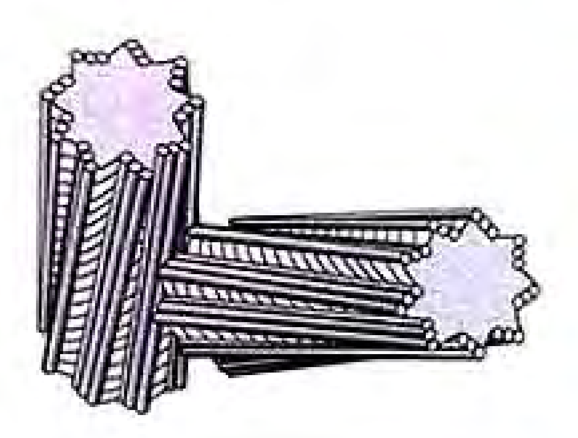
13 **What is the relation between :** Golgi apparatus and the elimination of the bacteria causing lung inflammation ?

14 "Nerve cell has the ability to transmit the nerve impulses from the skin to the muscles directly". **How far this statement is correct ? With explanation.**



15 **In the opposite figure :**

What is the similarity between this organelle **and** the ribosomes ?



16 **What is the difference between :** a muscle in the human finger and a muscle in the esophagus wall ?

17 **The opposite graph illustrates the effect of pH on the activity of two enzymes (X) and (Y) which are extracted from the human digestive canal when digesting a food substance at temperature (37°C), study it, then answer :**



(a) What is the reason for carrying out this experiment at 37°C ?

(b) What is the effect of the increase of pH on the activity of enzyme (Y) ?

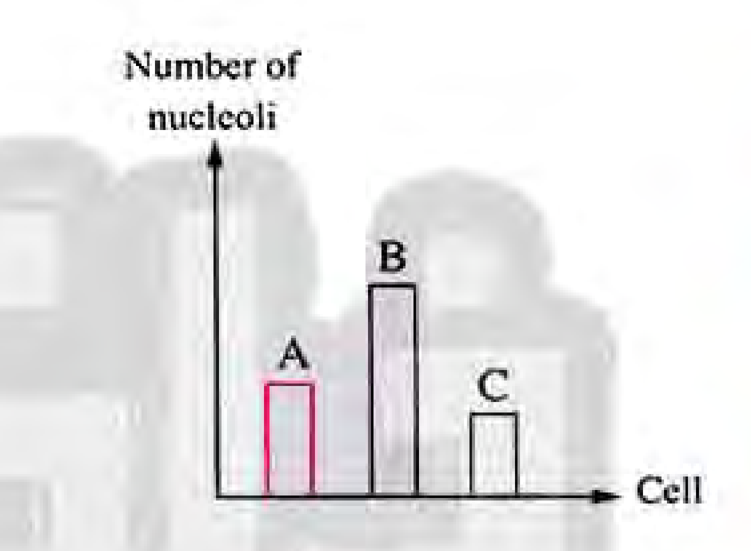
Model Exam 7

Choose the correct answer (1 : 10) :

1. The conversion of oil from the liquid state to the solid state by adding hydrogen is due to the conversion of the ....

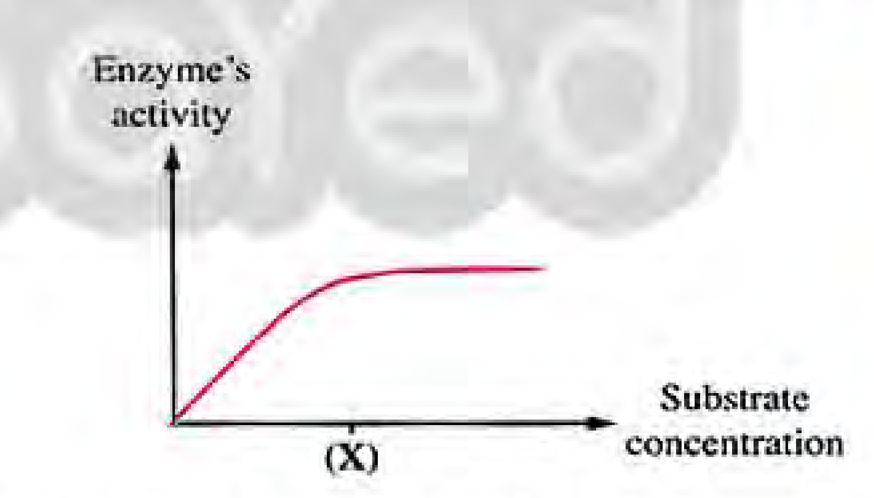
(a) chemical bonds among its atoms into ionic bonds.
(b) trihydric alcohol into monohydric alcohol.
(c) saturated fatty acids into unsaturated fatty acids.
(d) unsaturated fatty acids into saturated fatty acids.

2.  The opposite graph represents a number of nucleoli of three different animal cells. Which of the following represents the cell (B) ? ....



(a) A cell of skin.
(b) A cell of stomach.
(c) A cell of leg bone.
(d) A cell of the muscles.

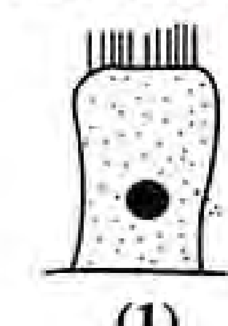
3. From the opposite graph that illustrates the effect of the substrate concentration on the activity of enzyme that is extracted from the human digestive canal, the activity of enzyme doesn't increase after the concentration (X), is due to ....

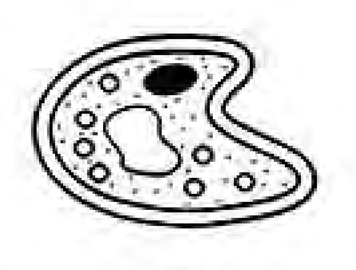


(a) the change of the optimal pH of the medium in which the enzyme works.
(b) the consumption of all molecules of the substrate.
(c) the consumption of all molecules of the enzyme.
(d) the arrival of temperature to 55°C.

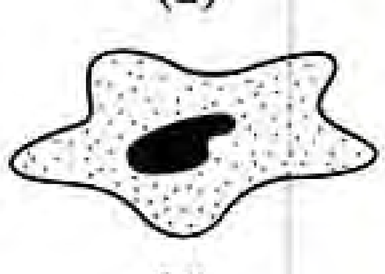


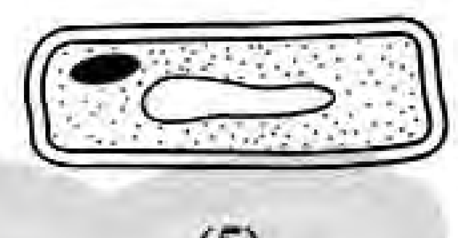
4 The following figures illustrate 6 cells, which of the following are plant cells and which of them are animal cells ? ....

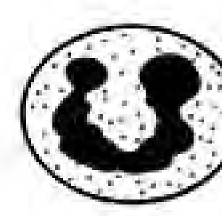

(1)


(2)


(3)


(4)


(5)


(6)

	Plant cells	Animal cells
(a)	(2), (3) & (4)	(1), (5) & (6)
(b)	(1), (3), (5) & (6)	(2) & (4)
(c)	(2) & (5)	(1), (3), (4) & (6)
(d)	(1), (4) & (6)	(2), (3) & (5)

5 The living cell needs to some mineral ions as calcium. Through which of the following will the calcium pass into the cell ? ....

(a) The heads of phospholipids.
(b) The tails of phospholipids.
(c) Cholesterol molecules.
(d) Protein molecules.

6 On placing a living cell of the human liver in a nutritive medium containing a radioactive phosphorus isotope (P^{32}), which of the following molecules in the cell contains this radioactive isotope ? ....

(a) Glycogen.
(b) Albumin protein.
(c) DNA
(d) Glucose.

7 A student examined a transverse section in a herbaceous plant stem, he found that it contained a tissue whose cells are rectangular in shape and thickened by cellulose substance and also contained chloroplasts, according to the student's observation, we conclude that this tissue acts on ....

(a) supporting the plant and storage of starch.

(b) supporting the plant and performing the photosynthesis process.

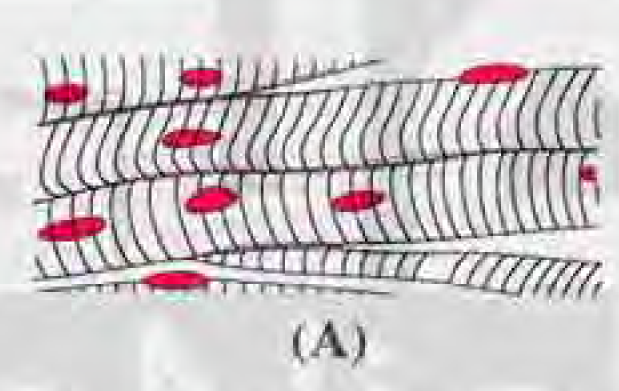
(c) the aeration for the plant and storage of starch.

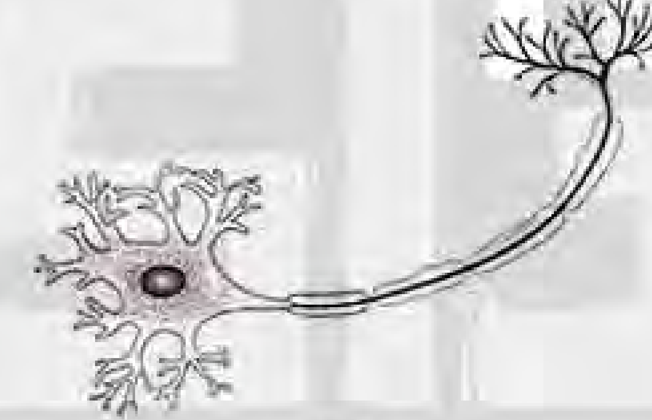
(d) the aeration and performing the photosynthesis.

8 If you know that when two molecules of monosaccharides are linked together, a molecule of water is removed. What is the number of water molecules produced on the formation of 5 maltose molecules ? ....

(a) 9 (b) 5 (c) 4 (d) 1

9 In the two following figures, cell (B) stimulates cells (A) to contract, this process is benefit in ....


(A)


(B)

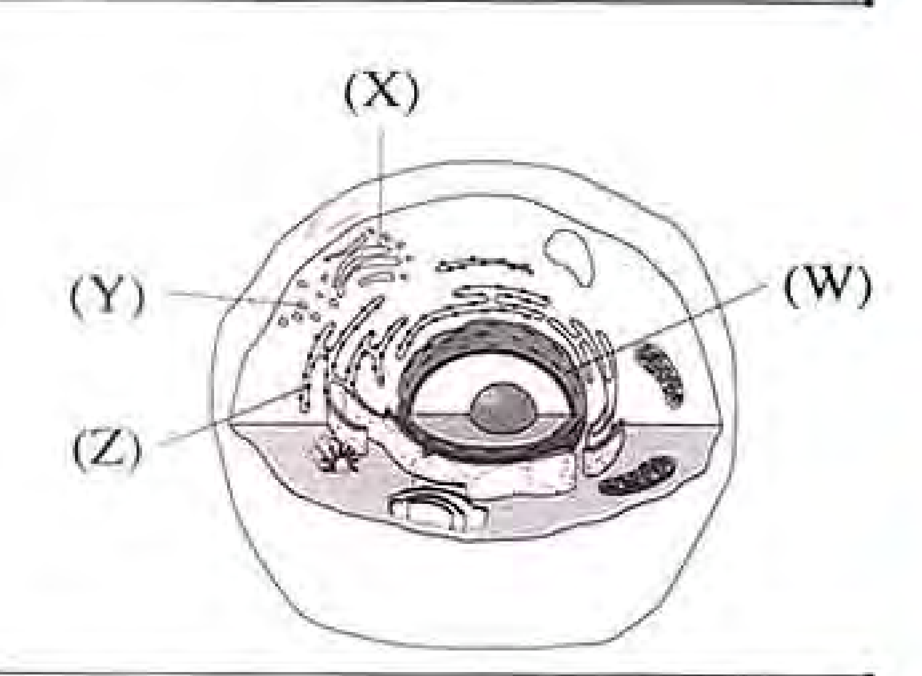
(a) the movement of food inside the digestive canal.

(b) the pumping of blood from the heart in the blood vessels.

(c) the raising up of a book on the office.

(d) the secretion of milk outside the breast.

10 Which of the structures illustrated in this figure is produced by the organelle that is responsible for the aggregation of the proteins and insertion of some changes on them ? ....



(a) (W). (b) (X).

(c) (Y). (d) (Z).

?

Answer the following questions (11 : 17) :

11 There is a nitrogen element in each of proteins and nucleic acids, **explain this.**

12 **What is the similarity between :** the tissue that lines the blood capillaries and the tissue that lines the stomach ?

13 **Compare between :** what happens in muscles during exercises **and** after some hours of eating a meal rich in carbohydrates **(in the light of your study of the metabolism)**.

14 **Give reason for :** the number of cristae of the mitochondria increases in the cells of birds muscles.

15 **What is the relation between :** the cytoplasm and supporting the cell ?

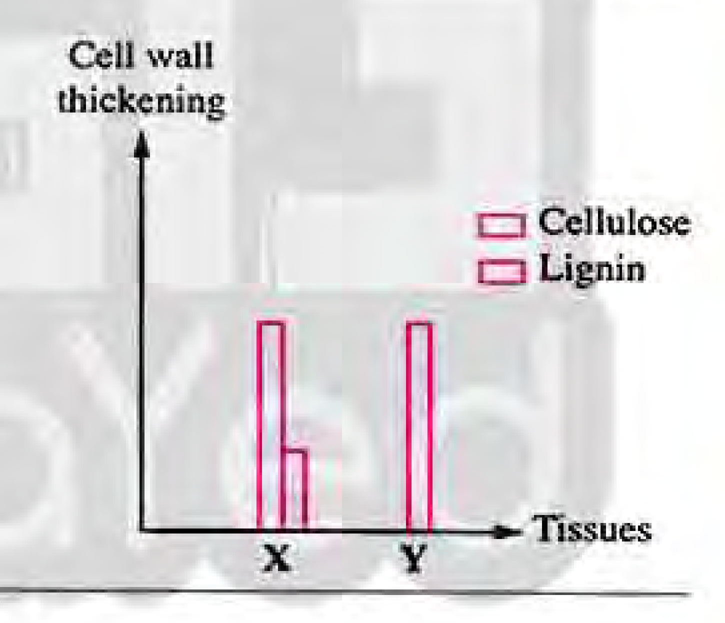
16 **From the following diagram :**

X + Y → Z

If (X) is a sugar that gives a positive result with Benedict's reagent, (Z) is present in the baby milk. **What does each of (X and Z) represent ?**

17 **The opposite graph illustrates the thickening of the cell walls in two types of cells that are found in the plant tissues (X) and (Y), study it, then answer :**

What is the difference between the two tissues (X) and (Y) ?





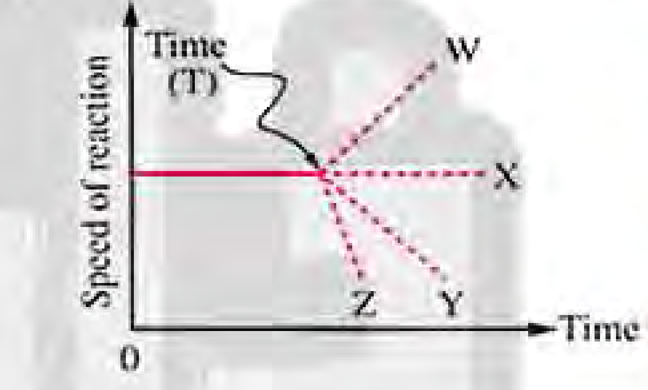
Model Exam 8

Choose the correct answer (1 : 10) :

1 The ability of the wax covering plant leaves to decrease the water loss, because ....
- (a) it contains monohydric alcohols.
- (b) it is from the organic compounds.
- (c) it is from the macro-molecules.
- (d) it contains fatty acids.

2 The plant cell loses its ability to divide in case of the absence of ....
- (a) ribosomes.
- (b) centrosome.
- (c) dictyosome.
- (d) some cytoplasmic genes.

3 Which of the lines illustrated in the opposite graph expresses an enzymatic reaction inside the stomach, if the hydrogen ion concentration (pH) of the stomach decreases from 4 to 2 at time (T) ? ....

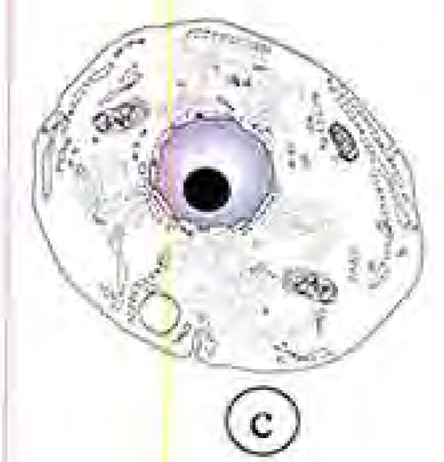


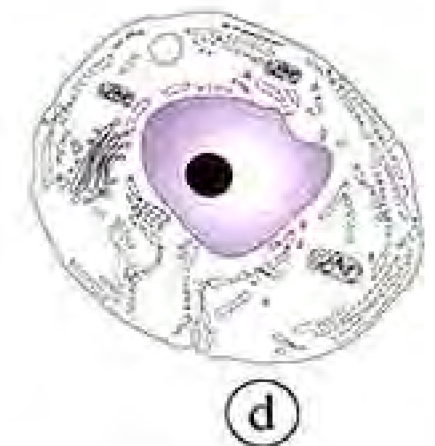
- (a) W
- (b) X
- (c) Y
- (d) Z

4 Which of the following cells can produce a large amount of lipase enzyme ? ....

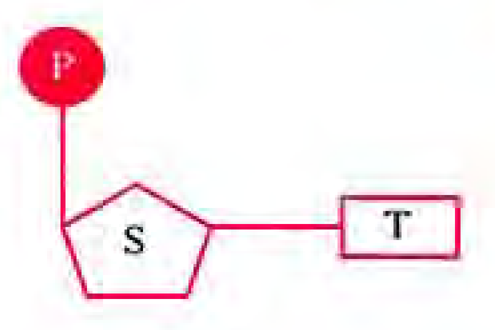

(a)

(b)


(c)

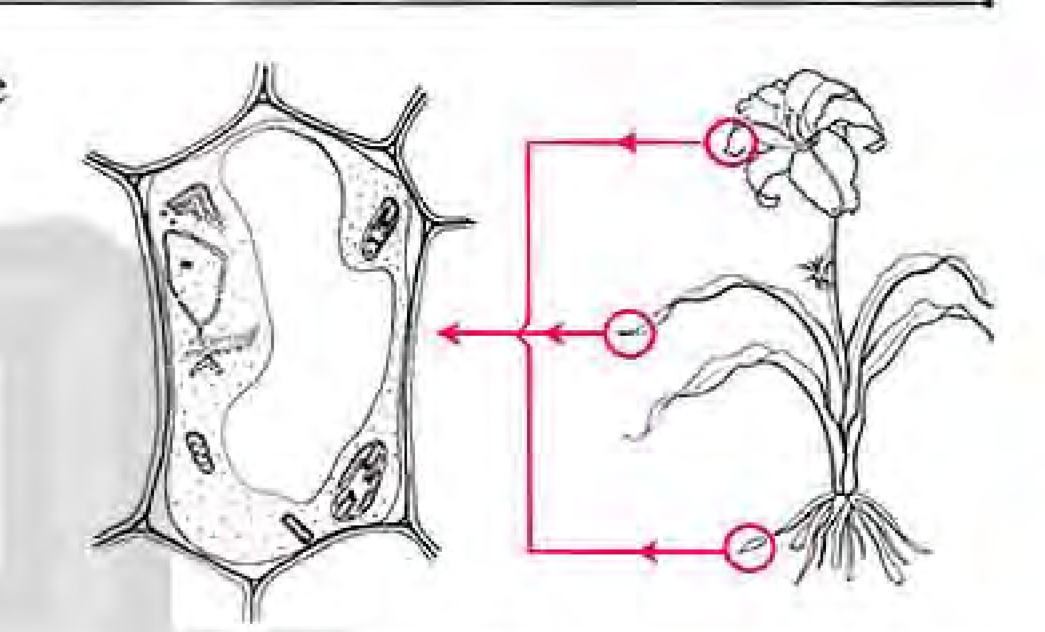

(d)

5 The opposite figure illustrates a nucleotide in a nucleic acid. The chemical formula of the structure (S) is ....



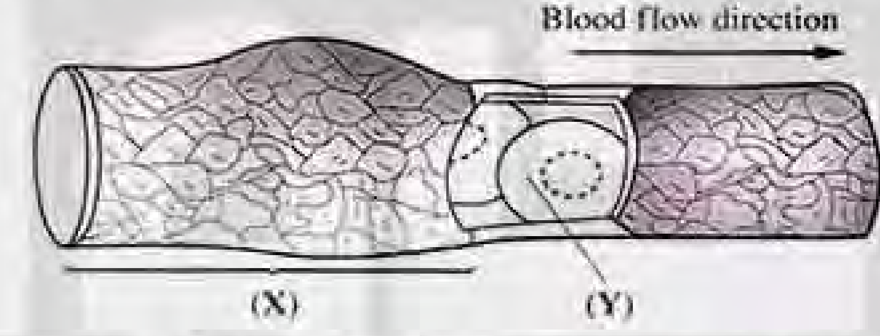
(a) $C_6H_{12}O_6$
(b) $C_5H_{10}O_4$
(c) $C_5H_{10}O_5$
(d) $C_{12}H_{22}O_{11}$

6 The two opposite figures illustrate a principle upon which the cell theory depends, who is the scientist stated this principle ? ....



(a) Schwann.
(b) Virchow.
(c) Schleiden.
(d) Van Leeuwenhoek.

7 The following figure illustrates the blood flow through an artery :



Which of the following illustrates the structure of each of (X) and (Y) ? ....

	(X)	(Y)
(a)	Simple tissue	Cell
(b)	Organ	Simple tissue
(c)	Compound tissue	Cell
(d)	Compound tissue	Simple tissue

8 Which of the following statements is correct about the unsaturated fats ? ....
(a) They are more common in animals than plants.
(b) They are more common in plants than animals.
(c) They are solid at the room temperature.
(d) Monohydric alcohols enter in their structure.

?

9 The opposite figure illustrates some cells that may be present in the ....

(a) digestive canal.
(b) blood.
(c) the lining of the kidney tubules.
(d) stomach wall.

10 What is the next step of the process that is illustrated in the following figure ? ....

(a) Inserting water molecules into the cell.
(b) Expelling out of bacteria that are engulfed outside the cell.
(c) Fusing the lysosome with the vesicle containing bacteria.
(d) Fusing the vesicle containing bacteria with the cell membrane.

Answer the following questions (11 : 17) :

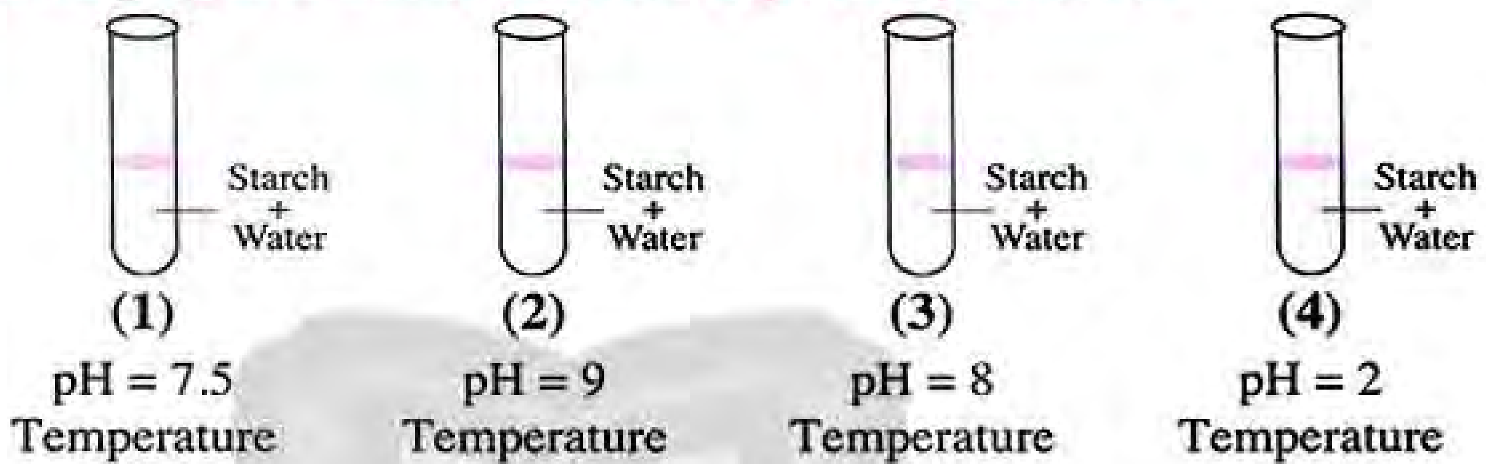
11 "Monosaccharides have the same molecular weight".
How far this statement is correct ? With explanation.

12 **What is the relation between :** the formation of carbohydrates and plastids inside the plant cell ?

13 Some types of plant tissues are similar with each other in the function, **explain this.**

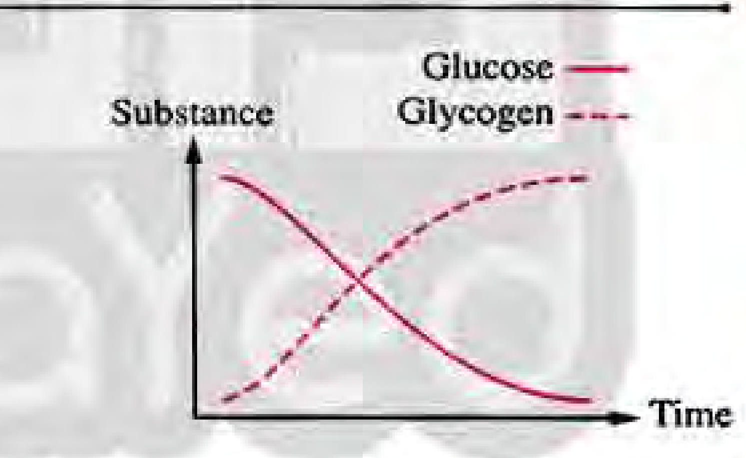
14 **What** is the number of the microtubules that the centrosome formed of in 3 neurons in human ?

15 **The following figures illustrate some digestive processes :**



Which of the previous digestive processes works better after adding amylase enzyme to each one of them ? **And why ?**

16 **The opposite graph illustrates a vital process that occurs in a part of the cell, study it, then determine :**



What is the organelle that is responsible for the occurrence of this vital process ?

17 **The two following figures illustrate two tissues in the human body, study them, then answer :**



Give an example for a site for each type.






Model Exam 9

Choose the correct answer (1 : 10) :

1. On chewing a piece of bread for some seconds, we found that its taste is sweet. From the previous, we can conclude that the saliva in mouth contains an enzyme that hydrolyzes ....

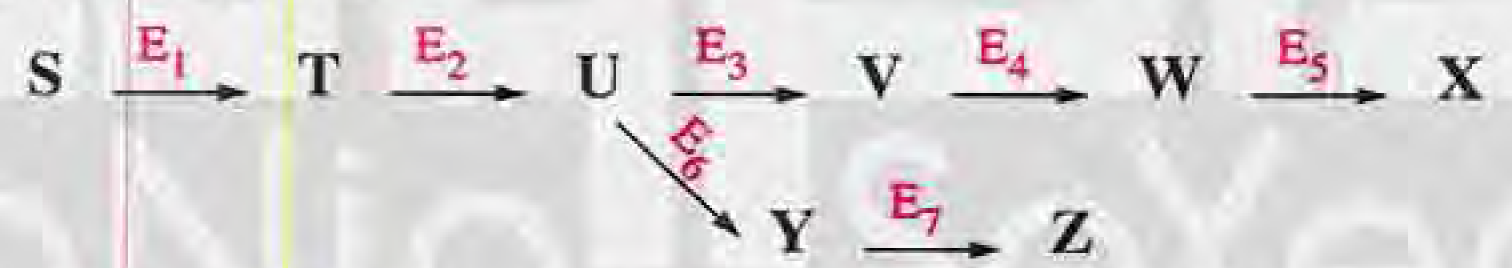
(a) starch to glycogen. (b) glycogen to starch.
(c) starch to cellulose. (d) starch to maltose.

2. The opposite figure illustrates the light microscope, the magnifying power of this microscope is ....



(a) 40x (b) 100x
(c) 400x (d) 4000x

3. In an experiment, it was added a substrate (S) in a conical to equal amounts of the enzymes (E_1, E_2, E_3, E_4, E_5, E_6 & E_7), where the following diagram illustrates the pathway of this reaction :

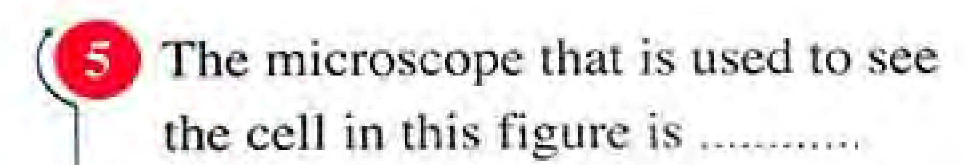


After 15 minutes from the beginning of the reaction, it was added an inhibitor for the enzyme (E_3) and the reaction was left till its ending, which result do you expect to happen ? ....

(a) Decreasing the rate of the production of (U) substance.
(b) Increasing the rate of the production of (Z) substance.
(c) No effect on the rate of the production of (Y) substance.
(d) Increasing the rate of the production of (V) substance.

4. The cell dies on removing each of the following, except the ....

(a) nucleus. (b) cell wall.
(c) cell membrane. (d) ribosomes.



5 The microscope that is used to see the cell in this figure is ....



(a) simple microscope.
(b) compound light microscope.
(c) transmission electron microscope.
(d) scanning electron microscope.

6 To form a chain of polypeptide from 3 different amino acids linked together several times with varied arrangements. So, the maximum number of the types of formed polypeptide chains is ....

(a) one chain.
(b) two chains.
(c) three chains.
(d) six chains.

7 Companion cells and parenchyma cells share in that both of them contain ....

(a) plastids.
(b) centrosome.
(c) protoplasm.
(d) lignin.

8 Which of the following represents the correct arrangement for the components of a multicellular living organism from the simplest to the most complex ? ....

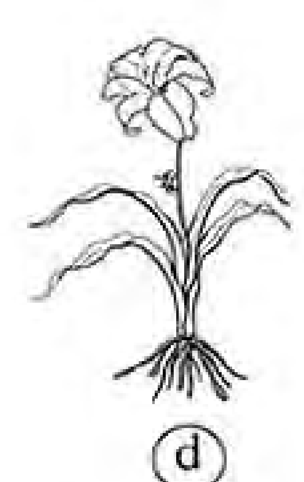
(a) Cells – Polymers – Organelles – Tissues.
(b) Polymers – Cells – Organelles – Tissues.
(c) Organelles – Polymers – Cells – Tissues.
(d) Polymers – Organelles – Cells – Tissues.

9 Which of the following represents an organ ? ....


(a)


(b)


(c)


(d)

?

10 Which of the following molecules doesn't move freely through the phospholipids of plasma membrane ? ....

(a) Water molecules only.
(b) Protein molecules only.
(c) Water molecules and oxygen.
(d) Protein molecules and oxygen.

Answer the following questions (11 : 17) :

11 **From the following diagram :**

Compound (X) + **Compound (Y)** → **Compound (Z)**

If (Z) is a compound present in the body of penguin and helps it in keeping its temperature in the severe cold regions. **Conclude what each of the biological compounds (X) and (Y) represents.**

12 Cell wall in the plant cell acts on protecting, supporting and acquiring it its characteristic shape, **what is the structure that performs the same function in the animal cell ?**

13 **What is the relation between :** the iodine element and the thyroxine ?

14 "Some plants live immersed completely in water as *Elodea* plant". **In the light of your study, conclude two examples** for the plant tissues that are rare in these plants to adapt with the aquatic environment.

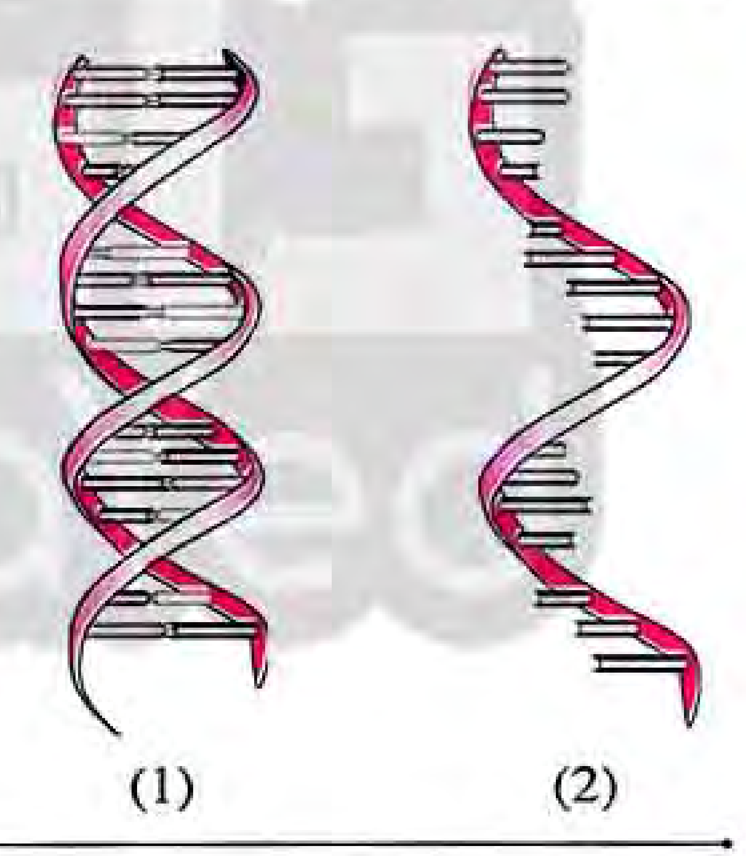
15 **Cellular division process is the most important vital process in a cell of the living organism :**

(a) **What** are the changes that are occurred in the cell during this process ?

(b) **What** is the role of the cell organelles that share in this process ?

16 Photosynthesis process and cellular respiration in the plant depends on each other. **Explain this.**

17 Study the two opposite figures, then **determine the similarity between them.**





Model Exam 10

Choose the correct answer (1 : 10) :

1. If you know that the binding of two molecules of glucose in which the removal of a water molecule takes place, the molecular formula of the polymer that consists of four molecules of glucose is ....

   (a) $C_{24}H_{48}O_{24}$ (b) $C_{24}H_{44}O_{22}$ (c) $C_{24}H_{42}O_{21}$ (d) $C_{18}H_{30}O_{15}$

2. Which of the following statements expresses the optimal temperature for all enzymes ? ....

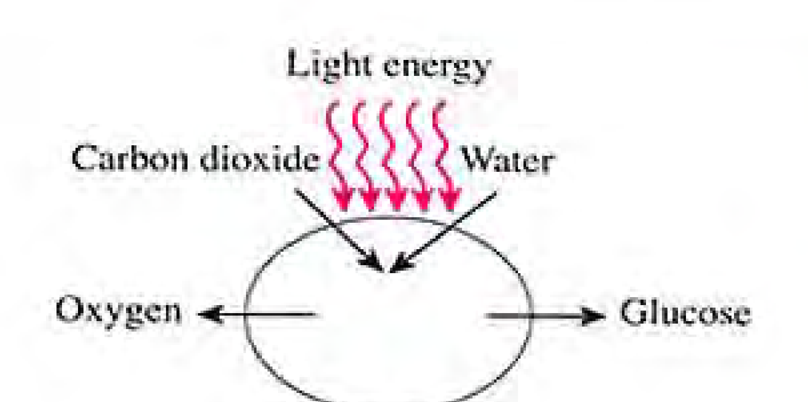
   1. The temperature at which the enzyme works efficiently.
   2. The highest temperature at which the enzyme works.
   3. It ranges between (35°C to 37°C).

   (a) (1), (2) and (3). (b) (1) and (2) only.
   (c) (1) only. (d) (3) only.

3. The opposite table illustrates four test tubes that contain equal amounts of starch with the salivary enzyme, in which test tube is the starch hydrolyzed rapidly ? ....

	Temperature	pH
(a)	27	2
(b)	37	2
(c)	27	7
(d)	37	7

4. The opposite figure represents a vital process that occurs in the ....



   (a) mitochondria.
   (b) chloroplast.
   (c) Golgi body.
   (d) leucoplast.

5 During the division of the white blood cells, we can see .... by the light microscope.

(a) two centrioles
(b) chromosomes
(c) cells with different nuclei
(d) the structure of the plasma membrane

6 To form a chain of polypeptide from 3 similar amino acids linked together several times with varied arrangements. So, the maximum number of the types of formed polypeptide chains is ....

(a) one chain.
(b) two chains.
(c) three chains.
(d) six chains.

7 Which of the following tissues represents some components of the vascular connective tissue ? ....

Tissue	Mitochondria	Ribosomes	Lysosomes
(X)	70%	10%	20%
(Y)	40%	30%	30%
(Z)	20%	70%	10%
(L)	20%	10%	70%

(a) (X).
(b) (Y).
(c) (Z).
(d) (L).

8 Which of the following is correct about the formation of starch from monosaccharides ? ....

(a) It is consumed energy in it.
(b) It is required to form peptide bonds.
(c) The reaction occurs only in animal cells.
(d) The chemical bonds of monosaccharides are broken.

?

9 Phloem tissue contains sieve tubes and companion cells, the sieve tubes supply the companion cells with the required energy to transport the food substances resulted from the photosynthesis process from the leaves to all the plant parts, ...

(a) the two statements are correct.
(b) the first statement is correct and the second statement is wrong.
(c) the first statement is wrong and the second statement is correct.
(d) the two statements are wrong.

10 Each of centrosome, centriole and centromere ....

(a) consists of two molecules.
(b) is present in the centre of an organelle of the cell organelles.
(c) is present in the brain cells.
(d) is related to the cell division.

Answer the following questions (11 : 17) :

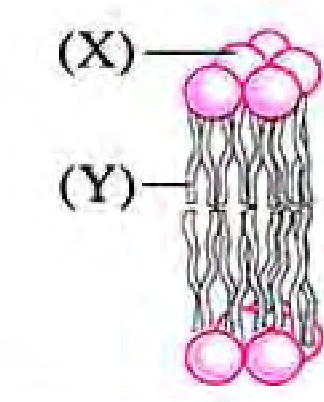
11 Muscular cells contain a greater number of mitochondria than the other types in the animal cells, **conclude the importance of the mitochondria for the muscular cells.**

12 **What happens if :** a child eats meals poor in calcium element "according to the growth process" ?

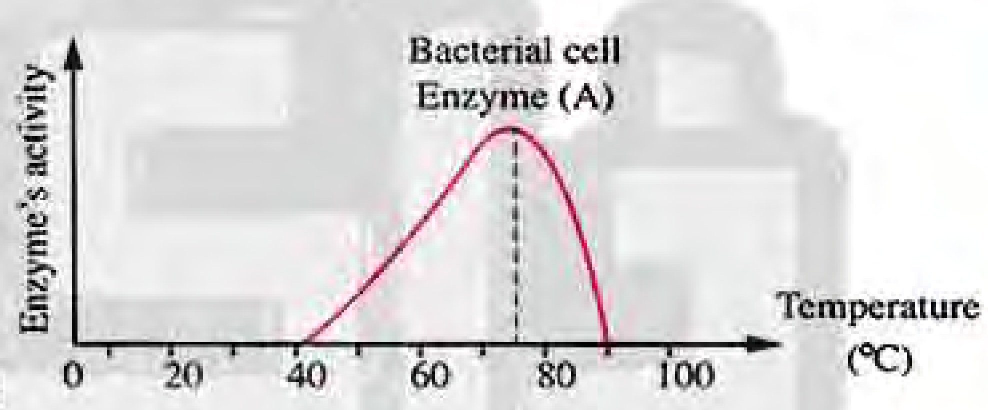
13 **What is the similarity between :** galactose sugar and lactose sugar ?

14 Simple microscope of Van Leeuwenhoek differs from the simple microscope of Robert Hooke. **Explain this.**

15 The opposite figure represents a part of the plasma membrane, **can** the part (X) replace the part (Y) ? **Explain your answer.**



16 The opposite figure illustrates the effect of the temperature on the activity of enzyme (A) in a type of bacteria that stimulates the formation of a poisonous substance for human, **what happens if** a person eats a food containing these bacteria ?
Explain your answer.



17 "Endoplasmic reticulum represents a communication system among the different organs in the human body". **How far this statement is correct ? With explanation.**

Answers of Model Exam 

1. ⓓ (A) represents a plant cell and (B) represents a muscular cell.
2. ⓐ Red blood cell.
3. ⓑ are characterized by the selective permeability.
4. ⓐ The nature of the enzyme is changed and its activity stops.
5. ⓐ plasma membrane.
6. ⓑ Orange / Blue / Violet
7. ⓓ Cell (4).
8. ⓒ mitochondria.
9. ⓑ lignin only.
10. ⓓ (3) ⟶ (1) ⟶ (4) ⟶ (2).

11. As the carbohydrates help in storing fats, leads to gaining the weight, when reducing the eating of meals rich in carbohydrates, the body begins to extract the energy from the fats stored in it, this is occurred in case of absence or lack of carbohydrates, where the amount of energy obtained from lipids is more than that obtained from the same amount of carbohydrates.

12.

Chromatid	Chromatin
• It is a filament that enters in the structure of chromosome.	• It is minute tangled filaments that are coiled around each other.
• It is composed of the nucleic acid (DNA) coiled around protein molecules called histones.	• During cell division, it changes into rod-like structures called chromosomes.

13. • Nitrogen element according to the simple proteins.
• Nucleic acids, phosphorus, iodine and iron according to the conjugated proteins.

14. As chloroplasts in which photosynthesis process occurs, where chlorophyll pigment transforms the light energy of the Sun into chemical energy that is stored in the chemical bonds of glucose sugar that is converted into starch to be stored in the plant cell for obtaining energy when needed.

15. The number of peptide bonds = 19 peptide bonds.

16. No. (1) : Rough endoplasmic reticulum.

17. • Enzyme (A) is most active at pH = 3.2
• Enzyme (B) is most active at pH = 8

Answers of Model Exam 

1. ⓑ the substrate is consumed completely.
2. ⓑ ✗ / ✗ / ✓ / ✓
3. ⓓ The reaction occurs with a slow rate.
4. ⓓ the cell wall.
5. ⓓ Plasma membrane, DNA and ribosome.
6. ⓓ Proteins only.
7. ⓐ Y / X & Y
8. ⓒ all the substances that consist of fatty acids.
9. ⓓ
10. ⓒ Ribosomes ⟶ Endoplasmic reticulum ⟶ Transporting vesicles ⟶ Golgi body.

11. Due to the absence of the fats layer under its skin. So, it has no ability to live in the north pole, while the polar fox has the fats layer under its skin that works as a thermal insulator to keep its body temperature in the polar (cold) regions.

12. **The statement is wrong /** As cytoplasm contains the cytoskeleton which is a network of filaments and microtubules that acquires the cell with a support to help it in maintaining its shape and form and also works as the passage to transport the different substances from a place to another inside the cell wall, in addition to the cell organelles which are divided into non-membranous and membranous organelles.

13. Both of them are conjugated proteins that are found in the human body, where chromatin consists of amino acids associated with nucleic acids, while the thyroxine consists of amino acids associated with iodine.

14. As the magnifying power of the microscope depends on the magnifying power of the used lenses, where :
- The magnifying power of the light microscope is low (maximum magnification doesn't exceed 1500x of the object's real size), because the type of the used lenses is glass that can't magnify the objects more than 1500x, because the image becomes unclear (blurred).

- While the magnifying power of the electron microscope is very high (may reach one million time or more of the object's real size), because the type of the used lenses is electromagnetic lenses that magnify the objects one million time or more to become the image highly contrasted and highly magnified.

15 (a) Lysosomes (Secretory vesicles).
(b) Lysosomes are formed by Golgi bodies and contain a group of digestive enzymes (lysosomal enzymes) that acts on the digestion of the large molecules of nutrients that are engulfed by the cell and change them into the simplest substances structurally which the cell can benefit from them.

16 No / Because enzymes are highly specific than other chemical catalysts, as each enzyme is specific for :
- One reactant substance called substrate.
- One type or a few types of reactions.

17 (a) It is present in the heart wall.
(b) The muscle fibers don't bind together and the heart can't beat in a rhythmic way as one functional unit.

Answers of Model Exam 3

1 ⓑ the number of the atoms of internal elements that enter in the structure of sugar.

2 ⓑ The ability to see the cristae of the mitochondria.

3 ⓒ

4 ⓐ Nucleus.

5 ⓐ amino acids and rough endoplasmic reticulum

6 ⓑ Glucose and protein.

7 ⓓ

8 ⓓ 0.4

9 ⓓ DNA and RNA / Starch / Mineral ions

10 ⓑ Parenchyma cells / Xylem cells / Red blood cells

11 Because white blood cells contain the digestive enzymes that are present inside the lysosomes to digest and destroy the pathogens (influenza virus) which invade the human body. So, the body can get rid of this virus.

12 • Cell wall as in plant cells, fungi, algae and some types of bacteria.
• Cell membrane as in plant and animal cells.

13 One carboxyl group.

14 As nucleus is surrounded by a nuclear envelope having several tiny pores through which the substances pass between the nucleus and cytoplasm, where RNA transcribed inside the nucleus is transferred into cytoplasm to synthesize the protein, while mitochondria is surrounded by two membranes (one of them is inner and the other is outer) through which a group of folds known as "cristae" are extended to increase the surface area of the inner membrane on which the chemical reactions that produce energy take place.

15 **The route of insulin :**
Ribosomes ⟶ Rough endoplasmic reticulum ⟶ Transporting vesicles ⟶ Golgi bodies ⟶ Lysosomes (secretory vesicles) $\xrightarrow[\text{into the blood}]{\text{pours}}$ Target cell.

16 **The statement is wrong** / As the metabolic processes occur in most body cells, because during anabolic process the building of more complex substances through a chain of chemical reactions that consume energy takes place and during catabolic process the breaking down of the chemical bonds among atoms of the molecules takes place to extract the chemical energy stored in them.

17 The water loss during transpiration process will occur and the plant will wilt and die, because the wax that covers the plant leaves, especially the desert plants reduces the water loss during transpiration process.

Answers of Model Exam 

1 ⓓ haemoglobin and albumin

2 ⓒ (1) and (4).

3 ⓒ X / Y / W

4 ⓒ nuclear envelope.

5 ⓓ

6 ⓑ Lipids.

7 ⓓ mucus.

8 ⓐ each enzyme works efficiently at pH value that differs from the other.

9 ⓓ striated voluntary

10 ⓒ

11 (1) Foods rich in carbohydrates : because excess of eating carbohydrates helps in gaining a weight.
(2) Foods rich in fats especially saturated fats.
As reducing the eating of carbohydrates and fats help the body to obtain the energy from the fats that are already stored in the body, helping in getting rid of weight gain, because the body doesn't start to extract energy from the stored fats, unless in case of the absence of carbohydrates.

12 As the nucleus contains nucleoli that are found in abundance in the cells that form and secrete proteins, where inside the nucleus (RNA) is transcribed from the nucleic acid (DNA), then transferred into the cytoplasm through the tiny pores of the nuclear envelope to use in building (synthesis) the proteins which the cell needs.

$$\text{DNA} \xrightarrow{\text{Transcription}} \text{RNA} \xrightarrow{\text{Translation}} \text{Protein}$$

13 As there are spots that are from fatty substances soluble in benzene, because the lipids are insoluble in polar solvents such as water, but they are soluble in non-polar solvents such as benzene and carbon tetrachloride.

14 (1) The level of lighting (light intensity) is not adjusted.
(2) Sample is not stained, where the dye makes the image more clear.

15 ∵ The centrosome consists of two centrioles and each centriole has 9 groups of microtubules arranged in triplets = 9 × 3 = 27 tubules.
∴ One centrosome consists of 27 × 2 = 54 tubules.
∵ Each animal cell contains a centrosome. So, three animal cells contain 3 centrosomes.
∴ The number of microtubules in the three centrosomes = 54 × 3 = 162 tubules or 54 groups of tubules.

16 **The diagram is wrong** / As when increasing the temperature, the activity of enzyme decreases gradually up to the temperature at which its activity stops completely, due to changing in its normal structure and it doesn't return to its activity again on decreasing the temperature.

17 **(a)** As tissue no. (1) "Epidermis" is a compound epithelial tissue (stratified squamous tissue), while tissue no. (2) "Dermis" is a connective tissue (connective tissue proper).
(b) It protects the cells which it covers from harms, drought and pathogens (as microbes).

Answers of Model Exam 5

1 ⓓ (Z) and (L). 2 ⓑ (Y) and (Z).

3 ⓐ pH / Reaction speed

4 ⓑ The nucleus is necessary for the division process.

5 ⓑ leg.

6 ⓒ Starch / Carbon, hydrogen and oxygen / Glucose

7 ⓓ are a vascular tissue.

8 ⓒ Insulin. 9 ⓓ (D).

10 ⓒ Nucleus of a plant cell.

11 Because the mitochondria is from the membranous organelles, where it consists of two membranes (outer and inner) which contain phospholipids.

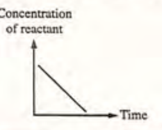
12 Blood tissue, as it is affected by iron to form haemoglobin and bone tissue, as calcium element enters in its structure.
(One example is enough)

13 As there are tiny pores in it through which nucleic acid RNA after its transcription from DNA inside the nucleus passes to the cytoplasm to use it in the protein synthesis.

14 (a) Compound (A) : glucose.
(b) Example for compound (C) : cellulose or starch or glycogen.
(One example is enough)

15 Magnifying power of the light microscope is the magnifying power of objective lens × the magnifying power of ocular lens = 100 × 20 = 2000x. So, the image is unclear, because the light microscope magnifies the objects up to 1500x of their real sizes and it can't be magnified more than that.

16 **The graph is wrong /** As the concentration of the reactant decreases by passing time in case of the constancy of other conditions (factors) that affect the enzymatic reaction, such as the concentration of enzyme, temperature and pH. So, the relation is reversible as shown in the following graph :



17

	Ribosomes	Rough endoplasmic reticulum
Similarities :	• Both of them are located in the cytoplasm. • Both of them are responsible for synthesizing the proteins.	
Difference :	They are non-membranous organelles.	It is a membranous organelle.

Answers of Model Exam 6

1 ⓑ waxes.

2 ⓓ mitochondria.

3 ⓒ

4 ⓑ Lysosome.

5 ⓒ Van Leeuwenhoek.

6 ⓐ Amino acids and fatty acids.

7 ⓐ (1).

8 ⓓ (4).

9 ⓑ the wall of the heart.

10 ⓑ

11 As the dyes (stains) are used to stain or colour certain parts of the specimen to become more clear, but from the disadvantages of the dyes is that they kill the living specimens.

12 These leaves will wilt and the plant will die, because these leaves don't contain green plastids (chloroplasts) that are responsible for the photosynthesis process, where the chloroplasts contain chlorophyll pigment that transforms the light energy to chemical energy that is stored in the chemical bonds of glucose sugar.

13 As Golgi apparatus forms the lysosomes that contain digestive enzymes to digest and destroy the pathogens (bacteria) that cause the lung inflammation. So, it plays a role in the elimination of the bacteria causing lung inflammation.

14 **The statement is wrong /** Because the nerve cell transmits the nerve impulses (messages) from the skin (receptor organ) to the spinal cord that is present inside the vertebral column and then to the effector organs, such as muscles.

15 Both of them are non-membranous organelles that are found in the cytoplasm.

16

Muscle in the finger	Muscle in the esophagus wall
• Skeletal muscle. • It consists of striated voluntary muscle fibers.	• Smooth muscle. • It consists of unstriated involuntary muscle fibers.

17 (a) Because two enzymes (X) and (Y) work efficiently at the temperature 37°C, where this temperature is the optimal temperature for the action of both enzymes.

(b) The enzyme's activity decreases until it stops, because each enzyme has an optimal pH value at which it works with a maximum efficiency.

Answers of Model Exam 7

1 ⓓ unsaturated fatty acids into saturated fatty acids.

2 ⓑ A cell of stomach.

3 ⓒ the consumption of all molecules of the enzyme.

4 ⓒ (2) & (5) / (1), (3), (4) & (6)

5 ⓓ Protein molecules.

6 ⓒ DNA

7 ⓑ supporting the plant and performing the photosynthesis process.

8 ⓑ 5

9 ⓒ the raising up of a book on the office.

10 ⓒ (Y).

11 As proteins (polymers) are made up of smaller molecules (monomers) called amino acids which consist of carbon (C), hydrogen (H), oxygen (O) and nitrogen (N), while nucleic acids (polymers) are made up of smaller molecules (monomers) called nucleotides which contain carbon (C), hydrogen (H), oxygen (O), phosphorus (P) and nitrogen (N) atoms.

12 Both of them are from the simple epithelial tissue of the animal whose cells are arranged in one layer.

13 • During exercises, the glycogen that is stored in the muscles converts into glucose (i.e. catabolic process) to supply the muscles with energy, where during glucose oxidation the stored energy in the chemical bonds of glucose molecules is released to be stored in ATP compounds, then these compounds transferred to the muscles.

• After eating a meal rich in carbohydrates, excess carbohydrates (glucose) is converted into glycogen to be stored in the muscle and liver cells (i.e. anabolic process).

14 Because they work on increasing the inner surface area on which the chemical reactions that produce energy take place, in order to increase the production of energy needed by the birds muscles.

15 As the cytoplasm contains cytoskeleton which is a network of filaments and microtubules, where it acquires the cell with a support to help it in maintaining its shape and form. So, the cytoplasm works on supporting the cell.

16 • (X) : glucose.

• (Z) : lactose.

17

Tissue (X) "Sclerenchyma tissue"	Tissue (Y) "Xylem tissue"
• Simple tissue. • It is a non-living tissue whose cells are characterized by that their walls are thickened by lignin substance, in addition to cellulose.	• Compound tissue. • It consists of parenchyma cells, vessels and tracheids whose walls are thickened by lignin.
• It supports and strengthen the plant by acquiring it the hardness and elasticity.	• It transports water and salts from the root to the stem, then to the leaves and supports the plant.

Answers of Model Exam 8

1 ⓓ it contains fatty acids.

2 ⓓ some cytoplasmic genes.

3 ⓐ W

4 ⓐ

5 ⓑ $C_5H_{10}O_4$

6 ⓒ Schleiden.

7 ⓒ Compound tissue / Cell

8 ⓑ They are more common in plants than animals.

9 ⓒ the lining of the kidney tubules.

10 ⓒ Fusing the lysosome with the vesicle containing bacteria.

11 **The statement is wrong** / Because the ribose sugar is a monosaccharide which contains five carbon atoms ($C_5H_{10}O_5$), where the monosaccharides contain carbon atoms ranging from (3 : 6), but all monosaccharides agree with each other in having a low molecular weight not having the same molecular weight.

12 As in the green plastids (chloroplasts), the photosynthesis process occurs to produce the glucose sugar (simple sugar) that the plant cell uses it in the production of energy in mitochondria and the excess is stored in the form of starch (complex sugar) in leucoplasts to be used by the cell for obtaining energy when needed.

13 As collenchyma and sclerenchyma (simple tissues) have the same function, where they act on supporting the plant and acquiring it with elasticity. Also, xylem tissue and phloem tissue (compound plant tissue) act as a vascular tissue to transport nutrients and water in the plant.

14 Number of microtubules of centrosomes in 3 neurons = 0

15 In tube no. (1) the digestion occurs better / Due to the presence of starch (substrate) at the suitable pH (weak alkaline) and temperature (37°C) and these conditions are suitable for the action of amylase enzyme.

16 Smooth endoplasmic reticulum.

17 • Tissue no. (1) : is usually present connected with the skeleton, such as the muscles of arms, leg and trunk.
• Tissue no. (2) : is present in the heart wall.

Answers of Model Exam 9

1 ⓓ starch to maltose.
2 ⓒ 400x
3 ⓑ Increasing the rate of the production of (Z) substance.
4 ⓑ cell wall.
5 ⓑ compound light microscope.
6 ⓓ six chains.
7 ⓒ protoplasm.
8 ⓓ Polymers – Organelles – Cells – Tissues.
9 ⓒ
10 ⓑ Protein molecules only.

11 • Compound (X) : Saturated fatty acids.
• Compound (Y) : Glycerol.

12 Cytoplasm which contains a network of filaments and microtubules called cytoskeleton which acts on acquiring the plant with a support to maintain its shape and form and also the cell membrane covers the animal cell and prevents the spreading out of the protoplasm.

13 As thyroxine is a conjugated protein which consists of amino acids associated with iodine. So, iodine element enters in the structure of thyroxine.

14 • Xylem tissue.
• Sclerenchyma tissue.
As the plant is entirely support by the water.

15 (a) During the cell division, the chromatin changes into rod-like structures called chromosomes. Each chromosome splits longitudinally, forming two identical chromatids, during metaphase two chromatids are joined together by centromere to form chromosome.
(b) • Nucleus that contains the chromatin that changes into chromosomes.
• Centrosome : plays an important role in it, where the spindle filaments extend between the two centrioles that are present at each pole of the cell. So, these centrioles withdraw the chromosomes towards the cell poles to help in the cell division.

16 As during the photosynthesis process, the glucose sugar is produced that is used by the cell during the cellular respiration to produce the energy that is stored in the form of ATP compounds used by the cell for accomplishing all the vital processes.

17 Both of them are biological macro-molecules (nucleic acids) whose basic units are nucleotides and contain the nitrogenous bases adenine, guanine and cytosine.

Answers of Model Exam 10

1 ⓒ $C_{24}H_{42}O_{21}$
2 ⓒ (1) only.
3 ⓓ 37 / 7
4 ⓑ chloroplast.
5 ⓒ cells with different nuclei
6 ⓐ one chain.
7 ⓓ (L).
8 ⓐ It is consumed energy in it.
9 ⓑ the first statement is correct and the second statement is wrong.
10 ⓓ is related to the cell division.

11 The number of mitochondria increases in muscular cells to increase the production of energy needed by the muscles, as they are storehouse for the substances that are necessary for storing the energy from cellular respiration, as a result of nutrients oxidation (especially glucose), where this energy is stored in the form of ATP compounds and the cell can extract this energy from these ATP compounds once more. So, the mitochondria represent the centres of energy production in the cell (the energy storehouse in the cell).

12 This child will expose to a lot of risks, where the decrease of calcium leads to the weakness of bones, because skeletal connective tissue (bones) whose intercellular substance is solid in which calcium deposits.

13 Both of them are simple sugars. So, they have a low molecular weight, are soluble in water and have a sweet taste.

14 As Van leeuwenhoek microscope in which the used lenses with the ability to magnify the objects up to 200 times of their real sizes and used for examining different substances, such as water of ponds, blood and others, while the simple microscope of Robet Hooke used to examine a piece of cork and he found that it is composed of small boxes arranged in rows and he named each box by the word "cell".

15 The part (X) can't replace the part (Y) and vice versa / Because if the part (X) replaces the part (Y), the part facing the outside of the cell is hydrophobic tails, therefore the water can't enter inside the cell, leading to the shrinkage of the cell, losing its function and its death.

16 **Nothing occurs** / As the enzyme (A) that stimulates the formation of the poisonous substance starts its work at temperature (40°C), where its optimum temperature of this enzyme is (75°C), while the human body temperature is (37°C). So, this enzyme can't work.

17 **The statement is correct** / As endoplasmic reticulum forms an internal transport system that benefits in transferring the substances from a part to another inside the cell and transfers substances between the nucleus and cytoplasm.